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Environmental Radiation Data
Report 33, January-March 1983

(U.S.) Office of Radiation Programs
Washington, DC

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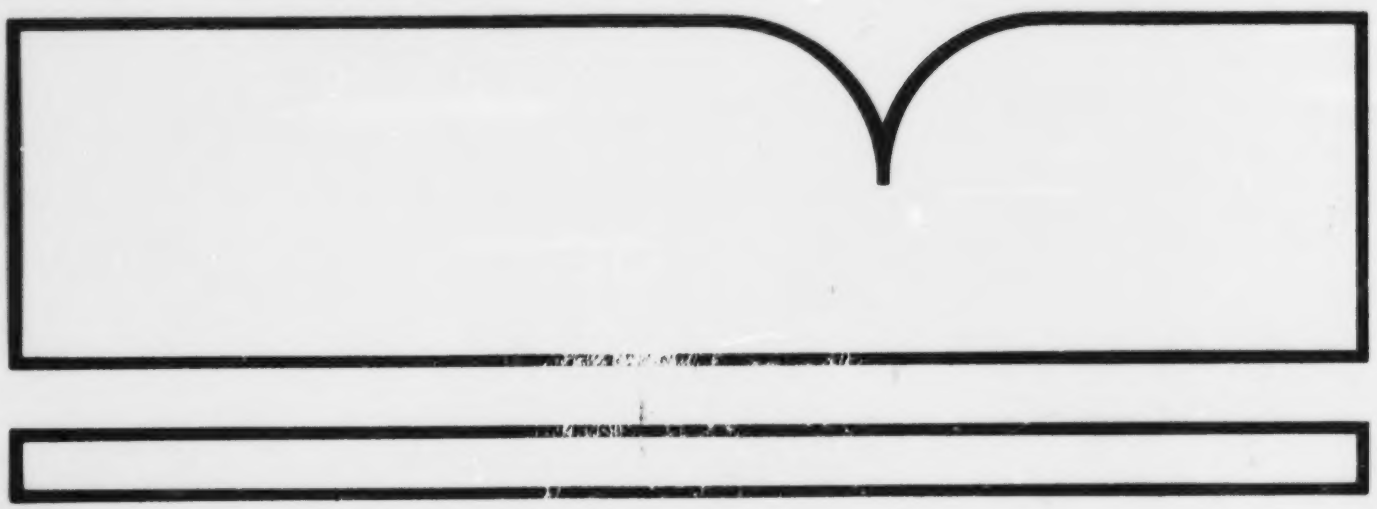

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16. ABSTRACT

Environmental Radiation Data (ERD) is compiled and distributed quarterly by the Office of Radiation Programs Eastern Environmental Radiation Facility (EERF), Montgomery, Alabama. Data from the similar networks operated by contributing States, Canada, Mexico, and the Pan American Health Organization are reported in (ERD) when available. The ERAMS is comprised of nationwide sampling stations that provide air, surface and drinking water and milk samples from which environmental radiation levels are derived. The major emphasis for ERAMS is toward identifying trends in the accumulation of long-lived radionuclides in the environment. The radiation analyses performed on these samples include gross alpha and gross beta levels, gamma analyses for fission products and specific analyses for uranium, plutonium, strontium, iodine, radium, krypton and tritium. This monitoring effort also serves to provide ancillary information on releases into the environment from stationary sources such as nuclear power reactors, fuel fabrication and reprocessing plants and natural background levels.

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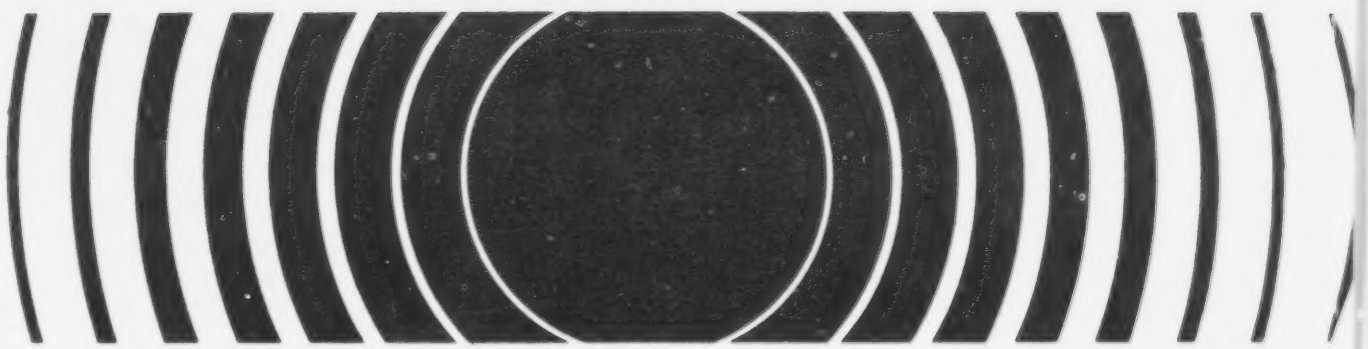

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E N V I R O N M E N T A L

R A D I A T I O N

D A T A

REPORT 33

January - March 1983

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Office of Radiation Programs

Preface

Environmental Radiation Data (ERD) is compiled and distributed quarterly by the Office of Radiation Programs' Eastern Environmental Radiation Facility (EERF), Montgomery, Alabama. Data from the Environmental Radiation Ambient Monitoring System (ERAMS), and similar networks operated by contributing States, Canada, Mexico, and the Pan American Health Organization are reported in (ERD) when available.

ERAMS was established in 1973 by the U. S. Environmental Protection Agency's Office of Radiation Programs (ORP). The ERAMS is comprised of nationwide sampling stations that provide air, surface, and drinking water and milk samples from which environmental radiation levels are derived. The major emphasis for ERAMS is toward identifying trends in the accumulation of long-lived radionuclides in the environment.

1. Sampling locations are selected to provide optimal population coverage while functioning to monitor fallout from nuclear devices and other forms of radioactive contamination of the enviromnent.

2. The radiation analyses performed on these samples include gross alpha and gross beta levels, gamma analyses for fission products and specific analyses for uranium, plutonium, strontium, iodine, radium, krypton and tritium. This monitoring effort also serves to provide ancillary information on releases into the environment from stationary sources such as nuclear power reactors, fuel fabrication and reprocessing plants and natural background levels.

E N V I R O N M E N T A L R A D I A T I O N

D A T A

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DATA - Reporting Rationale and Procedures

The intent of EPA's Office of Radiation Programs in establishing the Environmental Radiation Ambient Monitoring System was to provide continuous, accurate and usable environmental radiation data for the public. Therefore, new data reporting procedures were developed to allow better interpretation of the data. The most significant change in this reporting procedure is that all specific radionuclide analyses will be reported as the counting results indicate, whether the number is negative, zero, or positive.

Reporting Rationale

Frequently, concentrations of a radionuclide in environmental media are close to zero. When the actual concentration of a nuclide is zero, the net counting results should statistically show a distribution of negative and positive numbers about zero. This occurs when the background count is subtracted from a sample which has only background activity. Prior to July 1975, ERAMS data were not reported numerically when the results were less than a specified reporting level or minimum detectable level. The present reporting procedure allows all the data to be reported and evaluated statistically without an arbitrary cutoff of small or negative numbers. This approach will facilitate estimates of bias in the nuclide analyses and will allow better evaluation of distributions and trends in environmental data.

When reviewing the data in this report, caution should be exercised in the interpretation of individual negative values. Obviously, a negative activity value does not have physical significance. Such numbers, however, are significant when taken together with other observations which indicate that the true value of a distribution is near zero. When an average of several measurements produces a result less than zero, this indicates a negative bias in the measurement procedure.

(1) Reported Values

Specific Analyses - All specific radionuclide analyses will be reported as the counting results indicate, whether the number is negative, zero, or positive. Numerical values given are as of sample collection date.

Gross Analyses - The actual value of gross radioactivity measurements will be reported, unless the value is below the minimum detectable level (MDL) at the 2 sigma confidence level, then < minimum detectable level will be reported.

MDL is defined as the 3 sigma error of the background. A tabulation of MDL's is given in the following table.

(2) Reported Error Terms

Each reported value for specific analyses will be accompanied by a counting error term at the 2 sigma (95%) confidence interval. Potassium concentrations are determined by specific activity analyses. Error terms are therefore reported as counting errors. At the very low levels characteristic of most ERAMS measurements, counting error is the greatest contributor to overall error.

(3) Significant Figures

All reported values will be rounded to no more than three significant figures. The last significant figure will be increased by one if the figure following is five or greater, otherwise it is left unchanged.

(4) Reporting Levels

The reporting units, smallest increments for reporting, and minimum detectable levels for each isotope are shown in table 1. Smallest increments are sometimes considerably smaller than minimum detectable amounts to avoid truncation errors in averaging.

(5) Averages

Averages will be calculated along with appropriate error terms in an annual summary and analysis of ERAMS data. In calculating these averages, all values of individual data including negative numbers will be utilized. Averages will not be included in ERD quarterly reports.

TABLE 1

ERAMS Reporting Increments and Minimum Detectable Levels

for Radionuclide Analyses

Radionuclide	Media	Reporting Units	Reporting Increments	Minimum Detectable Levels
Gross alpha	Water	pCi/l	1 pCi/l	2 pCi/l
Gross beta	Air	pCi/m^3	.01 pCi/m^3	.01 pCi/m^3
	Water	pCi/l	1 pCi/l	1 pCi/l
	Precipitation	nCi/m^2	.01 nCi/m^2	.01 nCi/m^2(a)
Tritium	Water	nCi/l	.1 nCi/l	.2 nCi/l
	Milk	nCi/l	.1 nCi/l	.2 nCi/l
Carbon-14	Milk	pCi/l	1 pCi/l	15 pCi/l
Krypton-85	Ambient Air	pCi/m^3	.1 pCi/m^3	2 pCi/m^3
Plutonium-238, 239	Air	aCi/m^3	.1 aCi/m^3	.015 pCi(b) per sample
	Milk	pCi/l	.001 pCi/l	.015 pCi per sample
	Water	pCi/l	.001 pCi/l	.015 pCi per sample
Uranium-234, 235,238	Air	aCi/m^3	.1 aCi/m^3	.015 pCi(b) per sample
	Milk	pCi/l	.001 pCi/l	.015 pCi per sample
	Water	pCi/l	.001 pCi/l	.015 pCi per sample
Radium-226	Water	pCi/l	.1 pCi/l	.1 pCi/l
Strontium-90	Milk	pCi/l	.1 pCi/l	1 pCi/l
	Water	pCi/l	.1 pCi/l	1 pCi/l

Radionuclide	Media	Reporting Units	Reporting Increments	Minimum Detectable Levels
Strontium-89	Milk	pCi/l	1 pCi/l	5 pCi/l(c)
Iodine-131	Milk	pCi/l	1 pCi/l	10 pCi/l(c)
	Water	pCi/l	1 pCi/l	10 pCi/l(c)
	Water (specific radiochemical analysis)	pCi/l	.1 pCi/l	.4 pCi/l
Iodine-129	Milk	fCi/l	.1 fCi/l	.4 fCi/l
Iodine-127	Milk	g/l	10 g/l	10 g/l
Cesium-137	Milk	pCi/l	1 pCi/l	10 pCi/l
	Water	pCi/l	1 pCi/l	10 pCi/l
Barium-140	Milk	pCi/l	1 pCi/l	10 pCi/l(c)
	Water	pCi/l	1 pCi/l	10 pCi/l(c)
Potassium	Milk	g/l	.1 g/l	.12 g/l
	Water	g/l	.1 g/l	.12 g/l
Potassium-40	Water	pCi/l	1 pCi/l	100 pCi/l

(a) The value in terms of nCi/m^2 would be dependent on precipitation (mm).
(b) This value in terms of pCi/m^3 would be dependent on the air volume.
(c) Activity as of the day of counting.

ENVIRONMENTAL RADIATION AMBIENT MONITORING SYSTEM (ERAMS)

SECTION I. Air Program

Airborne Particulates and Precipitation

Gross beta radioactivity measurements and certain specific analyses are performed on air particulates and precipitation samples as indicator measurements in assessing the general (national) impact of all contributing sources on environmental levels of radiation.

Airborne particulates are collected continuously at field stations representing wide geographic coverage, including present and potential sources of environmental radioactivity. Sampling sites are located throughout the United States, Virgin Islands, and the Panama Canal.

Filters (10-cm diameter synthetic fiber) from air samplers are changed twice weekly and field measurements are made with a G-M survey meter at 5 hours and 29 hours after collection to allow for radon and thoron daughter product decay. Field estimates are reported to appropriate EPA officials by telephone or mail depending on the activity levels found.

The filters are sent to EERF for more sensitive analyses in a low background beta counter. Gamma scans are performed on all filters showing laboratory gross beta counts greater than 1 pCi/m^3. The lower gross beta values reported for laboratory measurements are largely due to the decay of radionuclides which occurred between the times of the field estimates and laboratory measurements.

Precipitation samples are collected at the field stations where air filters are collected. These samples are also sent to EERF where they are composited monthly for tritium, gross beta activity measurements and gamma scans.

These locations also correspond to airborne particulate and drinking water sampling locations selected for plutonium analyses. Plutonium-238, -239, and uranium-234, -235, and -238 analyses are performed annually on precipitation samples collected during March - May.

Tables 2 - 4 present the monthly average gross beta concentrations in airborne particulates for January - March 1983.

Tables 5 - 7 present the monthly average gross beta concentration in precipitation January - March 1983.

The tritium in precipitation samples for January - March 1983 at the selected stations are shown in Table 8.

A compilation of individual measurements is available from the EPA, EERF, Montgomery, AL 36193.

TABLE 2

AIRBORNE PARTICULATES
GROSS BETA CONCENTRATION
JANUARY 1983

LOCATION	# SAM	AIRBORNE PARTICULATES 5-HR FIELD ESTIMATE MAX (pCi/m^3)	MIN	AVG	EERF LAB MEASUREMENT MAX (pCi/m^3)	MIN	AVG
AK:ANCHORAGE	4	7.1	4.3	5.5	0.02	0.01	0.01
AL:MONTGOMERY	6	0.6	0.1	0.3	0.02	0.00	0.01
CA:BERKELEY	8	0.2	0.0	0.1	0.02	0.00	0.01
CA:LOS ANGELES	8	1.1	0.1	0.6	0.03	0.00	0.01
CO:DENVER	3	0.0	0.0	0.0	0.02	0.01	0.01
CT:HARTFORD	9	0.1	0.0	0.1	0.01	0.01	0.01
DE:WILMINGTON	8	0.1	0.0	0.1	0.02	0.01	0.01
FL:MIAMI	9	0.1	0.0	0.0	0.01	0.00	0.01
HI:HONOLULU	9	1.1	0.1	0.5	0.01	0.00	0.01
IA:IOWA CITY	9	0.5	0.0	0.2	0.02	0.01	0.02
ID:BOISE	9	0.2	0.0	0.1	0.02	0.00	0.01
ID:IDAHO FALLS	9	0.0	0.0	0.0	0.02	0.00	0.01
IL:CHICAGO	7	0.3	0.0	0.2	0.02	0.01	0.01
ME:AUGUSTA	9	0.2	0.0	0.1	0.01	0.00	0.01
MI:LANSING	3	0.1	0.0	0.1	0.02	0.01	0.01
MN:MINNEAPOLIS	3	0.1	0.0	0.0	0.01	0.01	0.01
MO:JEFFERSON CITY	8	0.3	0.0	0.2	0.02	0.01	0.01
ND:BISMARCK	7	0.8	0.0	0.2	0.04	0.01	0.02
NH:CONCORD	9	6.5	0.3	2.1	0.01	0.00	0.01
NJ:TRENTON	7	0.1	0.0	0.0	0.02	0.00	0.01
NM:SANTA FE	4	0.1	0.1	0.1	0.02	0.01	0.01
NV:LAS VEGAS	9	1.7	0.6	1.1	0.05	0.00	0.02
NY:ALBANY	8	0.1	0.0	0.1	0.02	0.01	0.01
NY:NEW YORK CITY	8	0.1	0.1	0.1	0.02	0.01	0.01
NY:NIAGARA FALLS	8	0.1	0.0	0.1	0.01	0.01	0.01
NY:SYRACUSE	3	0.1	0.0	0.1	0.01	0.01	0.01
NY:YAPHANK	7	0.1	0.0	0.0	0.01	0.01	0.01
OH:COLUMBUS	9	0.5	0.1	0.2	0.02	0.00	0.01
OH:PAINESVILLE	8	0.3	0.1	0.2	0.02	0.01	0.01
OR:PORTLAND	12	0.1	0.0	0.0	0.05	0.00	0.01
PA:HARRISBURG	9	0.6	0.1	0.2	0.02	0.01	0.01
PA:PITTSBURGH	9	0.3	0.1	0.2	0.02	0.01	0.02
RI:PROVIDENCE	9	0.2	0.0	0.1	0.01	0.01	0.01
SC:BARNWELL	1	0.2	0.0	0.0	0.01	0.00	0.00
SC:COLUMBIA	8	0.8	0.1	0.3	0.03	0.01	0.01
SD:PIERRE	9	0.9	0.1	0.4	0.03	0.01	0.02
TN:KNOXVILLE	2	0.5	0.2	0.3	0.02	0.01	0.01
TN:NASHVILLE	15	0.0	0.0	0.0	0.03	0.01	0.02
TX:AUSTIN	9	1.4	0.4	0.9	0.04	0.01	0.01
VA:LYNCHBURG	9	0.5	0.1	0.2	0.01	0.00	0.01
WA:SEATTLE	7	0.0	0.0	0.0	0.01	0.00	0.00
WA:SPOKANE	9	0.2	0.0	0.1	0.02	0.00	0.01
WI:MADISON	9	0.3	0.0	0.1	0.02	0.01	0.01

MINIMUM DETECTABLE LIMIT FOR FIELD ESTIMATES - .1 pCi/m^3
MINIMUM DETECTABLE LIMIT FOR LAB MEASUREMENT - .01 pCi/m^3

TABLE 3

AIRBORNE PARTICULATES
GROSS BETA CONCENTRATION
FEBRUARY 1983

LOCATION	# SAM	AIRBORNE PARTICULATES 5-HR FIELD ESTIMATE MAX (pCi/m^3)	MIN	AVG	EERF LAB MEASUREMENT MAX (pCi/m^3)	MIN	AVG
AL:MONTGOMERY	8	0.3	0.1	0.2	0.01	0.01	0.01
CA:BERKELEY	7	0.1	0.0	0.0	0.01	0.00	0.01
CA:LOS ANGELES	8	0.7	0.1	0.4	0.01	0.00	0.01
CO:DENVER	8	0.0	0.0	0.0	0.08	0.01	0.02
CT:HARTFORD	8	0.1	0.0	0.1	0.02	0.01	0.01
DE:WILMINGTON	7	0.1	0.0	0.1	0.01	0.01	0.01
FL:MIAMI	8	0.1	0.0	0.0	0.01	0.00	0.01
HI:HONOLULU	8	0.5	0.1	0.2	0.01	0.00	0.01
IA:IOWA CITY	8	0.4	0.0	0.1	0.02	0.01	0.01
ID:BOISE	8	0.2	0.0	0.1	0.01	0.00	0.01
ID:IDAHO FALLS	8	0.0	0.0	0.0	0.02	0.01	0.01
IL:CHICAGO	8	0.1	0.0	0.1	0.02	0.01	0.01
ME:AUGUSTA	8	0.1	0.0	0.1	0.02	0.01	0.01
MI:LANSING	8	0.2	0.0	0.1	0.02	0.01	0.01
MN:MINNEAPOLIS	8	0.1	0.0	0.0	0.02	0.01	0.01
MO:JEFFERSON CITY	8	0.7	0.1	0.3	0.04	0.01	0.02
ND:BISMARCK	8	0.2	0.1	0.1	0.03	0.01	0.02
NH:CONCORD	8	2.9	0.3	1.3	0.01	0.01	0.01
NJ:TRENTON	7	0.1	0.0	0.0	0.01	0.00	0.01
NM:SANTA FE	5	0.2	0.1	0.1	0.01	0.01	0.01
NV:LAS VEGAS	1	0.4	0.0	0.4	0.01	0.01	0.01
NY:ALBANY	7	0.1	0.0	0.0	0.02	0.01	0.01
NY:NEW YORK CITY	6	0.1	0.1	0.1	0.02	0.01	0.01
NY:NIAGARA FALLS	8	0.1	0.0	0.1	0.02	0.01	0.01
NY:SYRACUSE	9	0.7	0.0	0.2	0.01	0.01	0.01
NY:YAPHANK	6	0.1	0.0	0.0	0.01	0.01	0.01
OH:COLUMBUS	8	0.7	0.1	0.3	0.02	0.01	0.01
OH:PAINESVILLE	8	0.3	0.0	0.1	0.02	0.01	0.01
OR:PORTLAND	8	0.0	0.0	0.0	0.01	0.00	0.00
PA:HARRISBURG	8	0.4	0.1	0.2	0.03	0.01	0.02
PA:PITTSBURGH	8	0.2	0.0	0.1	0.03	0.01	0.02
RI:PROVIDENCE	6	0.1	0.0	0.1	0.02	0.01	0.01
SC:BARNWELL	2	0.0	0.0	0.0	0.01	0.01	0.01
SC:COLUMBIA	8	0.5	0.1	0.2	0.03	0.01	0.01
SD:PIERRE	8	0.6	0.1	0.2	0.03	0.01	0.02
TN:KNOXVILLE	8	0.4	0.1	0.2	0.02	0.01	0.01
TN:NASHVILLE	17	0.0	0.0	0.0	0.02	0.01	0.01
TX:AUSTIN	8	1.1	0.5	0.8	0.02	0.01	0.01
TX:EL PASO	4	2.2	0.6	1.5	0.03	0.01	0.02
VA:LYNCHBURG	8	0.2	0.0	0.1	0.02	0.01	0.01
WA:SEATTLE	7	0.1	0.0	0.0	0.01	0.00	0.00
WA:SPOKANE	8	0.2	0.1	0.1	0.02	0.00	0.01
WI:MADISON	8	0.2	0.0	0.1	0.01	0.01	0.01

MINIMUM DETECTABLE LIMIT FOR FIELD ESTIMATES - .1 pCi/m^3
MINIMUM DETECTABLE LIMIT FOR LAB MEASUREMENT - .01 pCi/m^3

TABLE 4

AIRBORNE PARTICULATES
GROSS BETA CONCENTRATION
MARCH 1983

LOCATION	# SAM	AIRBORNE PARTICULATES 5-HR FIELD ESTIMATE MAX (pCi/m^3)	MIN	AVG	EERF LAB MEASUREMENT MAX (pCi/m^3)	MIN	AVG
AL:MONTGOMERY	8	1.6	0.1	0.5	0.01	0.00	0.01
CA:BERKELEY	9	0.5	0.0	0.1	0.01	0.00	0.00
CA:LOS ANGELES	9	0.4	0.0	0.2	0.01	0.00	0.01
CO:DENVER	8	0.0	0.0	0.0	0.02	0.01	0.01
CT:HARTFORD	9	0.1	0.1	0.1	0.01	0.00	0.01
DE:WILMINGTON	10	0.2	0.0	0.1	0.02	0.00	0.01
FL:MIAMI	8	0.0	0.0	0.0	0.01	0.00	0.01
HI:HONOLULU	9	0.3	0.1	0.2	0.02	0.01	0.01
IA:IOWA CITY	9	0.7	0.0	0.2	0.02	0.01	0.01
ID:BOISE	9	0.1	0.0	0.1	0.01	0.00	0.00
ID:IDAHO FALLS	9	0.0	0.0	0.0	0.01	0.00	0.01
IL:CHICAGO	8	1.4	0.0	0.3	0.02	0.01	0.01
ME:AUGUSTA	9	0.1	0.0	0.1	0.01	0.00	0.01
MI:LANSING	9	0.3	0.0	0.1	0.02	0.01	0.01
MN:MINNEAPOLIS	9	0.1	0.0	0.1	0.02	0.00	0.01
MO:JEFFERSON CITY	9	1.0	0.0	0.3	0.06	0.01	0.02
MS:JACKSON	7	0.4	0.1	0.2	0.02	0.01	0.01
ND:BISMARCK	10	0.5	0.0	0.1	0.03	0.01	0.01
NH:CONCORD	9	1.6	0.3	0.7	0.01	0.00	0.01
NJ:TRENTON	7	0.1	0.0	0.0	0.01	0.01	0.01
NM:SANTA FE	5	0.9	0.2	0.4	0.01	0.01	0.01
NV:LAS VEGAS	7	0.8	0.2	0.3	0.01	0.00	0.01
NY:ALBANY	9	0.1	0.0	0.1	0.01	0.00	0.01
NY:NIAGARA FALLS	10	0.2	0.0	0.1	0.01	0.00	0.01
NY:SYRACUSE	7	0.0	0.0	0.0	0.01	0.00	0.01
NY:YAPHANK	9	0.1	0.0	0.0	0.01	0.00	0.01
OH:COLUMBUS	9	0.6	0.1	0.3	0.02	0.00	0.01
OH:PAINESVILLE	9	0.5	0.1	0.2	0.03	0.01	0.02
OR:PORTLAND	9	0.0	0.0	0.0	0.01	0.00	0.00
PA:HARRISBURG	9	0.4	0.1	0.2	0.02	0.00	0.01
PA:PITTSBURGH	9	0.2	0.0	0.1	0.02	0.00	0.01
RI:PROVIDENCE	7	0.2	0.0	0.1	0.01	0.00	0.01
SC:BARNWELL	2	0.1	0.0	0.1	0.00	0.00	0.00
SC:COLUMBIA	9	0.7	0.1	0.2	0.02	0.00	0.01
SD:PIERRE	9	0.3	0.0	0.1	0.02	0.01	0.01
TN:KNOXVILLE	9	1.0	0.1	0.4	0.08	0.01	0.02
TN:NASHVILLE	14	0.0	0.0	0.0	0.07	0.00	0.02
TX:AUSTIN	9	1.1	0.3	0.7	0.02	0.01	0.01
VA:LYNCHBURG	9	0.4	0.0	0.2	0.01	0.00	0.01
WA:SEATTLE	9	0.0	0.0	0.0	0.01	0.00	0.00
WA:SPOKANE	8	0.3	0.1	0.2	0.01	0.00	0.00
WI:MADISON	9	0.3	0.0	0.1	0.02	0.01	0.01
WV:CHARLESTON	6	1.5	0.0	0.5	0.01	0.01	0.01
WY:CHEYENNE	1	1.5	1.0	1.0	0.01	0.01	0.01

MINIMUM DETECTABLE LIMIT FOR FIELD ESTIMATES - .1 pCi/m^3
MINIMUM DETECTABLE LIMIT FOR LAB MEASUREMENT - .01 pCi/m^3

TABLE 5

GROSS BETA CONCENTRATION IN PRECIPITATION

JANUARY 1983

LOCATION	DEPTH (mm)	ACT. (nCi/m^2)	± 2s	SPECIFIC GAMMA ACT. (pCi/l)
AL:MONTGOMERY	162.5	0.21	0.08	ND
CA:BERKELEY	23.4	0.01	0.01	ND
CT:HARTFORD	68.4	0.16	0.04	ND
ID:BOISE	49.5	0.05	0.03	ND
MI:LANSING	10.6	0.01	0.01	ND
MS:JACKSON	115.8	0.13	0.06	ND
ND:BISMARCK	7.5	0.01	0.00	ND
NJ:TRENTON	45.0	0.05	0.02	ND
NV:LAS VEGAS	6.9	0.04	0.01	ND
NY:NEW YORK CITY	30.0	0.01	0.01	ND
NY:NIAGARA FALLS	5.7	0.01	0.00	ND
OH:PAINESVILLE	15.0	0.14	0.01	ND
OR:PORTLAND	178.4	0.29	0.09	ND
PA:HARRISBURG	52.5	0.03	0.02	ND
SC:BARNWELL	110.0	0.14	0.05	ND
SC:COLUMBIA	111.3	0.68	0.09	ND
TX:AUSTIN	4.5	0.00	0.00	ND
VA:LYNCHBURG	19.7	0.04	0.01	ND

ND NO GAMMA ACTIVITY DETECTABLE
s SIGMA COUNTING ERROR

TABLE 6

GROSS BETA CONCENTRATION IN PRECIPITATION

FEBRUARY 1983

LOCATION	DEPTH	ACT. ± 2s		SPECIFIC GAMMA ACT.
	(mm)	(nCi/m^2)		(pCi/l)
AL:MONTGOMERY	180.8	0.18	0.08	ND
CA:BERKELEY	30.6	0.01	0.01	ND
CO:DENVER	3.3	0.06	0.00	ND
CT:HARTFORD	95.0	0.13	0.05	ND
ID:BOISE	40.0	0.04	0.02	ND
ID:IDAHO FALLS	52.3	0.03	0.02	ND
IL:CHICAGO	2.9	0.01	0.00	ND
MI:LANSING	25.9	0.13	0.02	ND
MS:JACKSON	273.9	0.32	0.15	ND
ND:BISMARCK	3.9	0.01	0.00	ND
NJ:TRENTON	61.3	0.15	0.03	ND
NV:LAS VEGAS	2.3	0.00	0.00	ND
NY:NEW YORK CITY	18.4	0.06	0.01	ND
NY:NIAGARA FALLS	10.5	0.02	0.01	ND
OH:PAINESVILLE	21.9	0.14	0.02	ND
OR:PORTLAND	201.3	0.15	0.09	ND
PA:HARRISBURG	42.5	0.03	0.02	ND
SC:BARNWELL	92.5	0.07	0.04	ND
SC:COLUMBIA	126.3	1.21	0.12	ND
TX:AUSTIN	37.5	0.05	0.02	ND

ND NO GAMMA ACTIVITY DETECTABLE
s SIGMA COUNTING ERROR

TABLE 7

GROSS BETA CONCENTRATION IN PRECIPITATION

MARCH 1983

LOCATION	DEPTH (mm)	ACT. ± 2s (nCi/m^2)		SPECIFIC GAMMA ACT. (pCi/l)
AL:MONTGOMERY	205.0	0.13	0.09	ND
CA:BERKELEY	80.1	0.03	0.04	ND
CO:DENVER	77.0	0.05	0.03	ND
CT:HARTFORD	220.3	0.33	0.11	ND
ID:BOISE	124.5	0.11	0.06	ND
ID:IDAHO FALLS	60.0	0.04	0.03	ND
IL:CHICAGO	78.5	0.08	0.04	ND
MI:LANSING	85.1	0.15	0.04	ND
MS:JACKSON	203.7	0.13	0.09	ND
ND:BISMARCK	51.9	0.04	0.03	ND
NJ:TRENTON	53.5	0.06	0.02	ND
NV:LAS VEGAS	3.7	0.01	0.00	ND
NY:NEW YORK CITY	59.5	0.05	0.03	ND
NY:NIAGARA FALLS	17.5	0.01	0.01	ND
OH:COLUMBUS	44.3	0.03	0.02	ND
OH:PAINESVILLE	85.0	0.09	0.04	ND
OR:PORTLAND	145.3	0.20	0.07	ND
PA:HARRISBURG	88.8	0.07	0.04	ND
SC:BARNWELL	32.5	0.06	0.02	ND
SC:COLUMBIA	240.0	0.41	0.12	ND
TX:AUSTIN	107.5	0.06	0.05	ND
VA:LYNCHBURG	49.3	0.06	0.02	ND

ND NO GAMMA ACTIVITY DETECTABLE
s SIGMA COUNTING ERROR

TABLE 8

PRECIPITATION
TRITIUM CONCENTRATION

JANUARY - MARCH 1983

LOCATION	JANUARY nCi/l ± 2s	FEBRUARY nCi/l ± 2s	MARCH nCi/l ± 2s
AL:MONTGOMERY	0.5 0.2	0.3 0.2	0.4 0.2
CA:BERKELEY	0.1 0.2	0.2 0.2	0.2 0.2
CO:DENVER	NS	0.3 0.2	0.2 0.2
CT:HARTFORD	0.2 0.2	0.3 0.2	0.3 0.2
ID:BOISE	0.2 0.2	0.2 0.2	0.2 0.2
ID:IDAHO FALLS	NS	0.3 0.2	0.2 0.2
IL:CHICAGO	NS	0.3 0.2	0.4 0.2
MI:LANSING	0.3 0.2	0.4 0.2	0.3 0.2
MS:JACKSON	0.2 0.2	0.3 0.2	0.2 0.2
ND:BISMARCK	0.1 0.2	0.3 0.2	0.2 0.2
NJ:TRENTON	0.2 0.2	0.2 0.2	0.2 0.2
NV:LAS VEGAS	0.1 0.2	0.3 0.2	0.2 0.2
NY:NEW YORK CITY	0.1 0.2	0.4 0.2	0.2 0.2
NY:NIAGARA FALLS	0.1 0.2	0.4 0.2	0.4 0.2
OH:COLUMBUS	NS	NS	0.3 0.2
OH:PAINESVILLE	0.3 0.2	0.3 0.2	0.3 0.2
OR:PORTLAND	0.2 0.2	0.2 0.2	0.1 0.2
PA:HARRISBURG	0.2 0.2	0.3 0.2	0.1 0.2
SC:BARNWELL	1.1 0.2	1.8 0.2	0.3 0.2
SC:COLUMBIA	0.1 0.2	0.4 0.2	0.1 0.2
TX:AUSTIN	0.1 0.2	0.3 0.2	0.2 0.2
VA:LYNCHBURG	0.1 0.2	NS	0.2 0.2

NS NO SAMPLE
s SIGMA COUNTING ERROR

Plutonium and Uranium in Airborne Particulates

Environmental radiation levels of plutonium and uranium are determined by the analyses of quarterly composite samples (air filters) collected from the continuously operating airborne particulate samplers. The number of continuously operating stations is being increased from the original 22 will eventually number 67 when all equipment is operational.

Analyses of the composited filters consist of ashing, separating by liquid ion exchange, and coprecipitation of the plutonium or uranium.

Concentration of the specific isotopes of plutonium-238, -239, and uranium-234, -235, and -238 are determined by alpha spectroscopy. The volume of air analyzed normally ranges from 25,000 to 40,000 m^3 for each quarterly composite.

Plutonium and uranium in airborne particulates data for October - December 1982 are shown for the 42 stations operating during this period in Table 9.

TABLE 9

PLUTONIUM AND URANIUM IN AIRBORNE PARTICULATES
OCTOBER - DECEMBER 1982 COMPOSITES

LOCATION	^{238}Pu aCi/m^3 ± 2s	^{239}Pu aCi/m^3 ± 2s	^{234}U aCi/m^3 ± 2s	^{235}U aCi/m^3 ± 2s	^{238}U aCi/m^3 ± 2s
AL:MONTGOMERY	0.8 0.5	0.8 0.5	9.1 2.3	0.3 0.4	10.1 2.4
CA:BERKELEY	0.5 0.7	1.3 0.9	9.5 1.9	0.4 0.4	8.8 1.8
CA:LOS ANGELES	1.1 1.0	3.2 1.4	32.5 5.4	0.6 0.6	22.0 4.1
CT:HARTFORD	0.9 0.8	1.3 0.7	20.7 3.3	0.4 0.4	16.6 2.8
DE:DOVER	0.2 0.5	0.6 0.4	8.3 1.7	0.7 0.4	7.9 1.6
FL:MIAMI	0.8 0.8	0.6 0.6	15.0 2.3	0.7 0.4	13.6 2.2
HI:HONOLULU	0.1 0.2	1.0 0.6	5.2 1.5	0.3 0.3	5.8 1.6
IA:IOWA CITY	5.4 2.2	0.7 1.0	17.9 4.0	0.7 0.6	16.3 3.8
ID:BOISE	0.3 0.5	2.0 0.8	12.8 2.2	0.2 0.2	12.4 2.2
ID:IDAHO FALLS	0.5 0.6	1.1 0.6	20.8 3.3	1.0 0.5	20.4 3.2
IL:CHICAGO	0.5 1.1	0.2 0.7	23.3 4.9	0.9 0.8	14.9 3.6
ME:AUGUSTA	0.5 0.4	1.0 0.6	23.0 5.2	0.5 0.8	24.0 5.4
MO:JEFFERSON CITY	0.2 0.3	0.5 0.3	13.8 2.8	0.5 0.5	8.7 2.1
ND:BISMARCK	1.4 1.2	1.9 1.2	27.6 4.2	1.4 0.8	23.5 3.8
NH:CONCORD	0.4 0.3	0.5 0.4	10.7 2.0	0.3 0.3	10.1 1.9
NJ:TRENTON	3.3 1.6	0.8 0.7	8.6 1.8	0.5 0.3	7.7 1.6
NM:SANTA FE	0.2 0.4	1.5 0.7	25.8 3.8	0.8 0.5	25.3 3.8
NV:LAS VEGAS	1.5 1.2	2.8 1.4	109.0 12.6	1.9 1.0	65.5 8.4
NY:ALBANY	1.3 1.6	0.1 0.6	26.6 4.8	2.0 1.2	27.2 4.7
NY:NEW YORK CITY	2.5 1.6	1.7 1.1	25.6 4.7	0.6 0.7	16.9 3.5
NY:NIAGARA FALLS	0.3 0.5	0.3 0.6	40.2 5.9	1.6 0.9	34.2 5.2
NY:SYRACUSE	0.0 0.4	0.5 0.4	29.3 4.6	0.9 0.6	27.6 4.3
OH:COLUMBUS	0.9 0.5	1.1 0.6	31.5 4.5	1.5 0.6	27.5 4.1
OH:PAINESVILLE	1.8 1.2	0.3 0.6	15.9 3.4	0.6 0.5	17.9 3.7
OH:TOLEDO	0.8 1.6	0.3 1.0	27.5 6.6	1.0 1.3	22.7 5.6
OR:PORTLAND	1.9 0.9	2.5 1.1	19.5 3.3	0.3 0.3	13.5 2.6
PA:HARRISBURG	-0.1 0.9	0.5 0.4	23.5 3.7	0.9 0.5	22.5 3.5
PA:PITTSBURGH	0.7 0.9	0.6 0.8	41.6 7.4	2.4 1.4	46.1 7.8
RI:PROVIDENCE	0.5 0.4	0.7 0.5	23.4 5.0	0.9 0.8	15.1 3.7
SC:BARNWELL	0.6 0.5	0.8 0.5	15.0 4.0	1.0 0.8	10.2 2.9
SC:COLUMBIA	0.3 0.3	0.2 0.2	28.6 6.0	0.4 0.5	21.6 4.8
SD:PIERRE	0.2 0.3	1.2 0.7	13.2 2.3	1.1 0.5	13.6 2.3
TN:NASHVILLE	2.1 1.4	0.3 0.5	20.1 4.7	0.8 0.9	19.8 4.5
TX:AUSTIN	0.2 0.4	1.5 0.6	11.3 2.1	0.6 0.4	10.3 1.9
TX:EL PASO	0.9 0.8	1.1 0.7	39.4 7.3	1.4 1.0	31.6 6.1
VA:LYNCHBURG	0.1 0.4	1.4 0.7	153.4 18.5	6.1 1.5	17.0 2.9
WA:SEATTLE	1.0 0.9	0.7 0.6	8.0 2.2	0.8 0.7	6.5 1.9
WA:SPOKANE	0.8 0.6	1.2 0.6	17.9 3.3	1.0 0.7	13.0 2.7
WI:MADISON	0.3 0.8	0.1 0.5	12.0 2.5	0.9 0.5	11.0 2.3

s SIGMA COUNTING ERROR

Krypton-85

Krypton-85 is a long-lived noble gas with a half life of 10.8 years. It is released into the atmosphere by nuclear reactor operations, fuel fabrication, fuel reprocessing, and nuclear detonations. Krypton-85 also occurs naturally in minor quantities primarily from the neutron capture of stable krypton-84 as well as spontaneous fission and neutron-induced fission of uranium. Monitoring of krypton-85 in the atmosphere has been conducted to identify and establish baseline levels and long-term trends.

Krypton-85 analysis began in January 1973 with sample collections and analyses being performed for 12 sampling locations. These locations were selected to provide atmospheric coverage of the United States with considerations being given to the proximity to fuel reprocessing plants, nuclear reactors, and wide geographic coverage.

Dry compressed air samples, collected at each location, are purchased from commercial air suppliers annually and shipped to the EERF where the krypton-85 is cryogenically separated and counted in a liquid scintillation system.

The Kr-85 results will be published when they are available

ERAMS

SECTION II. Water Program

The ERAMS water program provides ambient radiation data to assess the effects of the nuclear power industry, the natural radiation environment, and other nuclear sources on the nation's rivers, streams and drinking water supplies.

Surface Water

Grab samples are taken quarterly at 58 stations located downstream from operating or future nuclear facilities.

Surface water monitoring consists of tritium analyses quarterly and gamma scans annually. Tritium is the primary radioactive pollutant from nuclear power plants.

Tritium concentrations are determined by liquid scintillation counting of distilled samples. Gamma scans are performed annually to determine if there is a buildup of other contaminants.

Tritium concentrations for surface water samples for January - March 1983 are given in Table 10.

TABLE 10

SURFACE WATER
TRITIUM CONCENTRATION

JANUARY - MARCH 1983

LOCATION	SOURCE	DATE COLLECTED	nCi/l	± 2s
AL:DECATUR	TENNESSEE RIVER	1/ 6/83	0.5	0.2
AL:DOTHAN	CHATTAHOOCHEE R.	1/ 4/83	0.4	0.2
AL:SCOTTSBORO	TENNESSEE RIVER	1/ 5/83	0.8	0.2
CA:CLAY STATION	FOLSOM S. CANAL	1/21/83	0.2	0.2
CA:DIABLO CANYON	PACIFIC OCEAN	1/17/83	0.1	0.2
CA:EUREKA	HUMBOLDT BAY	1/ 6/83	0.1	0.2
CA:SAN ONOFRE	PACIFIC OCEAN	3/22/83	0.2	0.2
CO:GREELEY	SOUTH PLATTE RIVER	3/22/83	0.5	0.2
CT:EAST HADDAM	CONNECTICUT RIVER	1/26/83	0.2	0.2
CT:WATERFORD	LONG ISLAND SOUND	1/25/83	0.2	0.2
FL:CRYSTAL RIVER	GULF OF MEXICO	1/ 5/83	0.2	0.2
FL:FT. PIERCE	ATLANTIC OCEAN	1/ 6/83	0.4	0.2
FL:HOMESTEAD	BISCAYNE BAY	1/12/83	0.2	0.2
IA:CEDAR RAPIDS	CEDAR RIVER	1/11/83	0.3	0.2
ID:BUHL	SNAKE RIVER	1/12/83	0.2	0.2
IL:E. MOLINE	MISSISSIPPI RIVER	2/15/83	0.2	0.2
IL:OREGON	ROCK RIVER	2/15/83	0.3	0.2
IL:ZION	LAKE MICHIGAN	3/ 9/83	0.5	0.2
IL:ZION	LAKE MICHIGAN	1/15/83	0.4	0.2
LA:NEW ORLEANS	MISSISSIPPI RIVER	1/ 7/83	0.3	0.2
MA:PLYMOUTH	CAPE CODE BAY	1/ 6/83	0.3	0.2
MA:ROWE	DEERFIELD RIVER	3/ 3/83	0.3	0.2
MD:CONOWINGO	SUSQUEHANNA RIVER	1/25/83	0.2	0.2
MD:LUSBY	CHESAPEAKE BAY	1/11/83	0.3	0.2
ME:WISCASSET	MONTSEWAY BAY	1/ 4/83	0.3	0.2
MI:BRIDGMAN	LAKE MICHIGAN	1/ 5/83	0.3	0.2
MI:CHARLEVOIX	LAKE MICHIGAN	1/ 8/83	0.3	0.2
MI:MONROE	LAKE ERIE	1/ 9/83	0.3	0.2
MI:SO. HAVEN	LAKE MICHIGAN	1/ 5/83	0.4	0.2
MN:MONTICELLO	MISSISSIPPI RIVER	1/ 5/83	0.2	0.2
MN:RED WING	MISSISSIPPI RIVER	1/10/83	0.3	0.2
MS:PORT GIBSON	MISSISSIPPI RIVER	1/18/83	0.1	0.2
NC:CHARLOTTE	CATAWBA RIVER	1/12/83	0.5	0.2
NC:SOUTHPORT	ATLANTIC OCEAN	1/ 4/83	0.2	0.2
NE:RULO	MISSOURI RIVER	1/ 7/83	0.4	0.2
NJ:BAYSIDE	DELAWARE RIVER	1/ 5/83	0.3	0.2
NJ:OYSTER CREEK	OYSTER CREEK	1/13/83	0.1	0.2
NV:BOULDER CITY	COLORADO RIVER	1/19/83	0.2	0.2
NY:OSSINING	HUDSON RIVER	3/14/83	0.3	0.2
NY:OSWEGO	LAKE ONTARIO	2/15/83	0.3	0.2
NY:POUGHKEEPSIE	HUDSON RIVER	1/ 5/83	0.2	0.2
OH:TOLEDO	LAKE ERIE	1/ 5/83	0.4	0.2
OR:BRADWOOD	COLUMBIA RIVER	1/15/83	0.2	0.2
PA:DANVILLE	SUSQUEHANNA RIVER	1/12/83	0.3	0.2
SC:ALLENDALE	SAVANNAH RIVER	1/13/83	2.4	0.2

TABLE 10 (CONTINUED)

SURFACE WATER
TRITIUM CONCENTRATION

JANUARY - MARCH 1983

LOCATION	SOURCE	DATE COLLECTED	nCi/l	± 2s
SC:BROAD RIVER	BROAD RIVER	1/ 5/83	0.3	0.2
SC:HARTSVILLE	LAKE ROBINSON	1/31/83	1.6	0.2
TN:DAISY	TENNESSEE RIVER	2/15/83	0.7	0.2
TN:KINGSTON	CLINCH RIVER	1/17/83	1.5	0.2
TX:EL PASO	RIO GRANDE	1/20/83	0.2	0.2
TX:MATAGORDA	COLORADO RIVER	1/14/83	0.2	0.2
VA:DOSWELL	NORTH ANNA RIVER	1/ 7/83	2.4	0.2
VA:NEWPORT NEWS	JAMES RIVER	1/ 5/83	0.6	0.2
WA:NORTHPORT	COLUMBIA RIVER	1/ 6/83	0.3	0.2
WA:RICHLAND	COLUMBIA RIVER	1/13/83	0.3	0.2
WI:TWO CREEKS	LAKE MICHIGAN	1/10/83	0.2	0.2
WI:VICTORY	MISSISSIPPI RIVER	1/12/83	0.2	0.2
WV:WHEELING	OHIO RIVER	1/ 5/83	0.3	0.2

s SIGMA COUNTING ERROR

Drinking Water

The drinking water program provides ambient radiation monitoring relevant to the effects of the nuclear power industry, natural environmental levels, and other pertinent sources. These data serve to assess trends and anomalies in concentrations, and to compare with standards set forth in the EPA "National Interim Primary Drinking Water Regulations." These regulations provide for approval of supplies when the combined radium-226 and radium-228 levels do not exceed 5 pCi/l, when the gross alpha (excluding radon and uranium) levels do not exceed 15 pCi/l, when tritium levels do not exceed 20,000 pCi/l, when the strontium-90 levels do not exceed 8 pCi/l, and when the gross beta levels do not exceed 50 pCi/l.

Grab samples are taken at 78 sites which are either major population centers or selected nuclear facility environs.

The analyses include (a) tritium on a quarterly basis (b) gross alpha, gross beta, and strontium-90 on annual composites (gamma analyses are performed if the gross beta activity is greater than 10 pCi/l; radium-226 analyses are performed if the gross alpha exceeds 2 pCi/l; and radium-228 analyses are performed if the radium-226 activity falls between 3 and 5 pCi/l) (c) specific iodine-131 is performed on one quarterly sample per year for each station (d) an annual composite for plutonium-238, -239, uranium-234, -235, -238, for stations which demonstrate gross alpha levels greater than 2 pCi/l.

Tritium analyses are performed by scintillation counting of the distilled samples, gross beta, and gross alpha by evaporating an aliquot on stainless steel planchets for counting, and radium-226 by the standard emanation technique. Strontium-90 is determined by beta counting a strontium carbonate precipitate isolated by ion exchange.

The results of tritium in drinking water analyses for January - March 1983 are shown in Table 11.

The annual alpha, beta, gamma, radium, and strontium analyses for 1982 annual drinking water samples are shown in Table 12.

Plutonium and uranium analyses are similar to procedures given for air particulate samples . Analyses were altered to coincide with revised EPA standards. The results for 1982 composite samples are shown in Table 13.

All samples were taken as either a single grab sample or composite samples taken over 12 to 14 days.

TABLE 11

DRINKING WATER
TRITIUM CONCENTRATION

JANUARY - MARCH 1983

LOCATION	DATE COLLECTED	nCi/l	± 2s
AK:FAIRBANKS	1/14/83	0.4	0.2
AL:DOTHAN	1/ 4/83	0.3	0.2
AL:MONTGOMERY	1/ 7/83	0.3	0.2
AL:MUSCLE SHOALS	1/ 6/83	0.4	0.2
AL:SCOTTSBORO	1/ 5/83	0.5	0.2
CA:BERKELEY	1/10/83	0.1	0.2
CA:LOS ANGELES	1/10/83	0.1	0.2
CO:DENVER	3/22/83	0.3	0.2
CO:PLATTEVILLE	3/22/83	0.4	0.2
CT:HARTFORD	1/13/83	0.4	0.2
DC:WASHINGTON	1/10/83	0.3	0.2
DE:DOVER	1/ 4/83	0.1	0.2
FL:MIAMI	1/ 4/83	0.5	0.2
FL:TAMPA	1/26/83	0.1	0.2
GA:SAVANNAH	2/ 8/83	1.8	0.2
HI:HONOLULU	1/21/83	0.2	0.2
IA:CEDAR RAPIDS	1/ 7/83	0.5	0.2
ID:BOISE	1/ 6/83	0.1	0.2
ID:IDAHO FALLS	2/22/83	0.2	0.2
IL:MORRIS	1/ 6/83	0.4	0.2
IL:W. CHICAGO	1/ 4/83	0.2	0.2
KS:TOPEKA	1/ 5/83	0.5	0.2
LA:NEW ORLEANS	2/ 3/83	0.4	0.2
MA:LAWRENCE	1/11/83	0.1	0.2
MD:BALTIMORE	1/ 7/83	0.3	0.2
MD:CONOWINGO	1/25/83	0.2	0.2
ME:AUGUSTA	1/12/83	0.4	0.2
MI:DETROIT	1/18/83	0.7	0.2
MI:GRAND RAPIDS	1/19/83	0.1	0.2
MN:MINNEAPOLIS	1/ 7/83	0.4	0.2
MN:RED WING	1/ 3/83	0.2	0.2
MS:JACKSON	1/ 4/83	0.2	0.2
MS:PORT GIBSON	1/ 5/83	0.2	0.2
MT:HELENA	1/ 7/83	0.2	0.2
NC:CHARLOTTE	1/12/83	0.2	0.2
NC:WILMINGTON	1/28/83	0.3	0.2
ND:BISMARCK	1/10/83	0.3	0.2
NH:CONCORD	1/10/83	0.3	0.2
NJ:TRENTON	1/12/83	0.5	0.2
NJ:WARETOWN	1/13/83	0.1	0.2
NM:SANTA FE	1/10/83	0.2	0.2
NV:LAS VEGAS	1/10/83	0.4	0.2
NY:ALBANY	1/11/83	0.2	0.2
NY:NEW YORK CITY	1/19/83	0.2	0.2

TABLE 11 (CONTINUED)

DRINKING WATER
TRITIUM CONCENTRATION

JANUARY - MARCH 1983

LOCATION	DATE COLLECTED	nCi/l	± 2s
NY:NIAGARA FALLS	1/11/83	0.2	0.2
NY:SYRACUSE	1/11/83	0.3	0.2
OH:COLUMBUS	1/ 7/83	0.3	0.2
OH:EAST LIVERPOOL	2/17/83	0.4	0.2
OH:PAINESVILLE	1/ 6/83	0.4	0.2
OH:TOLEDO	1/ 5/83	0.3	0.2
OK:OKLAHOMA CITY	1/ 6/83	0.2	0.2
OR:PORTLAND	1/10/83	0.3	0.2
PA:COLUMBIA	1/13/83	0.3	0.2
PA:HARRISBURG	1/13/83	0.4	0.2
PA:PITTSBURGH	2/17/83	0.3	0.2
PC:ANCON	1/19/83	0.1	0.2
RI:PROVIDENCE	1/11/83	0.2	0.2
SC:BARNWELL	1/13/83	0.2	0.2
SC:COLUMBIA	1/ 5/83	0.3	0.2
SC:HARTSVILLE	1/31/83	0.2	0.2
SC:JENKINSVILLE	1/ 7/83	0.3	0.2
SC:SENECA	1/19/83	0.2	0.2
TN:KNOXVILLE	1/ 3/83	0.3	0.2
TX:AUSTIN	1/ 4/83	0.3	0.2
VA:DOSWELL	1/26/83	0.2	0.2
VA:LYNCHBURG	1/ 5/83	0.3	0.2
VA:VIRGINIA BEACH	1/14/83	0.4	0.2
WA:RICHLAND	1/13/83	0.4	0.2
WA:SEATTLE	1/11/83	0.1	0.2
WI:GENOA CITY	1/13/83	0.2	0.2
WI:MADISON	1/14/83	0.2	0.2

s SIGMA COUNTING ERROR

TABLE 12

DRINKING WATER
ALPHA, BETA AND GAMMA CONCENTRATION

1982

ANNUAL ANALYSES

LOCATION	TOTAL SOLIDS mg/l	GROSS BETA DATE CTD. pCi/l ± 2s	GROSS ALPHA DATE CTD. pCi/l ± 2s	^{90}Sr pCi/l ± 2s	^{226}Ra pCi/l ± 2s	SPECIFIC GAMMA ACTIVITY
AK:FAIRBANKS	180.8	2.6 1.0	0.7 0.8 2/ 8/83	0.0 0.1 2/ 8/83	NA	ND
AL:DOTHAN	151.4	1.0 0.9	-0.3 0.5 2/ 8/83	-0.3 0.2 2/ 8/83	NA	ND
AL:MONTGOMERY	65.6	1.7 0.9	0.3 0.3 2/ 8/83	0.1 0.2 2/ 8/83	ND	ND
AL:MUSCLE SHOALS	133.2	2.6 1.0	0.2 0.4 2/ 8/83	0.1 0.1 2/ 8/83	NA	ND
AL:SCOTTSBORO	119.0	2.0 1.1	0.3 0.4 2/ 8/83	0.3 0.1 2/ 8/83	NA	ND
AR:LITTLE ROCK	29.0	1.1 0.8	0.1 0.3 2/ 8/83	0.2 0.3 2/ 8/83	NA	ND
CA:BERKELEY	46.8	0.6 0.7	0.3 0.3 2/ 8/83	0.2 0.2 2/ 8/83	NA	ND
CA:LOS ANGELES	347.5	4.4 2.2	1.7 1.7 2/15/83	0.0 0.1 2/15/83	NA	ND
CO:DENVER	107.2	1.9 0.7	2.7 0.9 2/15/83	0.2 0.2 2/15/83	0.1 0.1	ND
CO:PLATTEVILLE	908.0	7.5 3.9	10.1 4.4 2/15/83	-0.1 0.3 2/15/83	0.3 0.1	ND
CT:HARTFORD	44.2	1.1 0.8	0.2 0.3 2/15/83	0.2 0.3 2/15/83	NA	ND
DE:DOVER	274.7	3.7 1.8	0.8 0.9 2/15/83	-0.1 0.1 2/15/83	NA	ND
FL:MIAMI	239.0	1.8 1.3	1.0 1.0 2/15/83	-0.1 0.1 2/15/83	NA	ND
FL:TAMPA	231.0	2.2 1.4	0.9 0.9 2/15/83	0.3 0.2 2/15/83	NA	ND

TABLE 12 (CONTINUED)

DRINKING WATER
ALPHA, BETA AND GAMMA CONCENTRATION

1982

ANNUAL ANALYSES

LOCATION	TOTAL SOLIDS mg/l	GROSS BETA DATE CTD. pCi/l ± 2s	GROSS ALPHA DATE CTD. pCi/l ± 2s	^{90}Sr pCi/l ± 2s	^{226}Ra pCi/l ± 2s	SPECIFIC GAMMA ACTIVITY
GA:BAXLEY	214.4	2.5 1.0	2.7 1.0 2/16/83	NA 2/16/83	2.4 0.1	ND
GA:SAVANNAH	94.2	1.5 0.9	0.0 0.4 2/16/83	0.4 0.2 2/16/83	NA	ND
HI:HONOLULU	203.8	2.3 1.2	-1.0 0.9 2/16/83	0.1 0.1 2/16/83	NA	ND
IA:CEDAR RAPIDS	170.2	2.5 1.0	0.4 0.6 2/16/83	0.0 0.2 2/16/83	NA	ND
ID:BOISE	82.8	2.4 0.8	1.9 0.6 2/16/83	0.1 0.1 2/16/83	NA	ND
ID:IDAHO FALLS	256.0	3.6 1.6	-1.2 1.2 2/16/83	-0.1 0.1 2/16/83	NA	ND
IL:CHICAGO	256.7	20.3 2.5	20.4 3.0 2/16/83	-0.1 0.2 2/16/83	9.5 0.1	ND
IL:MORRIS	328.5	22.8 3.7	0.1 1.1 2/16/83	0.0 0.1 2/16/83	NA	ND
KS:TOPEKA	322.5	8.3 2.6	0.1 1.4 5/20/83	0.1 0.1 5/20/83	NA	ND
LA:NEW ORLEANS	199.0	3.7 1.3	0.8 0.9 2/18/83	0.1 0.3 2/18/83	NA	ND
MA:LAWRENCE	91.6	1.0 0.8	0.3 0.4 2/18/83	0.4 0.2 2/18/83	NA	ND
MA:ROWE	69.2	0.9 0.8	0.2 0.3 2/18/83	0.1 0.1 2/18/83	NA	ND
MD:BALTIMORE	141.8	1.5 0.8	0.3 0.5 2/18/83	0.1 0.1 2/18/83	NA	ND
MD:CONOWINGO	203.0	1.2 1.3	0.2 0.6 2/18/83	0.1 0.1 2/18/83	NA	ND

TABLE 12 (CONTINUED)

DRINKING WATER
ALPHA, BETA AND GAMMA CONCENTRATION

1982

ANNUAL ANALYSES

LOCATION	TOTAL SOLIDS mg/l	GROSS BETA DATE CTD. pCi/l ± 2s	GROSS ALPHA DATE CTD. pCi/l ± 2s	^{90}Sr pCi/l ± 2s	^{226}Ra pCi/l ± 2s	SPECIFIC GAMMA ACTIVITY
ME:AUGUSTA	51.6	1.6 0.8	0.3 0.3 2/18/83	0.1 0.3 2/18/83	NA	ND
MI:DETROIT	120.2	1.1 0.8	0.4 0.6 2/25/83	0.7 0.2 2/25/83	NA	ND
MI:GRAND RAPIDS	170.8	1.5 1.1	0.4 0.7 2/25/83	0.7 0.3 2/25/83	NA	ND
MN:MINNEAPOLIS	105.4	[illegible] 1.0	0.2 0.4 2/25/83	0.0 0.1 2/25/83	NA	ND
MN:RED WING *	199.0	5.8 2.0	4.7 1.5 2/25/83	0.0 0.2 2/25/83	3.6 0.1	ND
MO:JEFFERSON CITY	267.0	3.4 1.8	2.3 1.3 2/25/83	NA 2/25/83	1.5 0.1	ND
MS:JACKSON	93.8	1.6 0.9	-0.2 0.4 2/25/83	0.2 0.2 2/25/83	NA	ND
MS:PORT GIBSON	356.0	0.0 0.1	3.1 1.8 2/25/83	0.2 0.2 2/25/83	0.1 0.1	ND
MT:HELENA	125.0	2.4 0.9	0.6 0.6 3/ 1/83	0.0 0.3 3/ 1/83	NA	ND
NC:CHARLOTTE	59.4	2.1 1.0	-0.1 0.3 3/ 1/83	0.0 0.3 3/ 1/83	NA	ND
NC:WILMINGTON	89.2	2.5 1.0	0.1 0.4 3/ 1/83	0.5 0.4 3/ 1/83	NA	ND
ND:BISMARCK	327.0	4.0 2.4	0.3 1.0 3/ 1/83	0.1 0.2 3/ 1/83	NA	ND
NE:LINCOLN	304.0	6.7 2.2	4.4 1.9 5/20/83	0.2 0.1 5/20/83	0.2 0.1	ND
NH:CONCORD	76.4	0.2 0.9	-0.1 0.3 3/ 1/83	0.0 0.1 3/ 1/83	NA	ND

TABLE 12 (CONTINUED)

DRINKING WATER
ALPHA, BETA AND GAMMA CONCENTRATION

1982

ANNUAL ANALYSES

LOCATION	TOTAL SOLIDS mg/l	GROSS BETA DATE CTD. pCi/l ± 2s	GROSS ALPHA DATE CTD. pCi/l ± 2s	^{90}Sr pCi/l ± 2s	^{226}Ra pCi/l ± 2s	SPECIFIC GAMMA ACTIVITY
NJ:TRENTON	120.2	2.0 1.0 3/ 1/83	-0.2 0.5 3/ 1/83	0.2 0.1 3/ 1/83	NA	ND
NJ:WARETOWN	80.8	1.9 0.8 3/ 1/83	1.5 0.6 3/ 1/83	0.1 0.1 3/ 1/83	NA	ND
NM:SANTA FE	175.6	3.0 0.8 3/ 1/83	7.2 1.4 3/ 1/83	0.0 0.1 3/ 1/83	0.1 0.1	ND
NV:LAS VEGAS	734.0	8.0 5.3 5/20/83	3.0 3.1 5/20/83	0.4 0.1 5/20/83	0.2 0.1	ND
NY:ALBANY	98.4	1.3 0.9 3/ 1/83	0.0 0.0 3/ 1/83	0.3 0.1 3/ 1/83	NA	ND
NY:NEW YORK CITY	35.8	0.8 0.9 3/ 1/83	-0.1 0.2 3/ 1/83	0.2 0.1 3/ 1/83	NA	ND
NY:NIAGARA FALLS	204.0	2.8 1.1 3/ 7/83	0.3 0.6 3/ 7/83	0.8 0.4 3/ 1/83	NA	ND
NY:SYRACUSE	115.8	1.7 0.9 3/ 7/83	0.6 0.5 3/ 7/83	0.4 0.6 3/ 7/83	NA	ND
OH:CINCINNATI	184.0	1.9 1.4 3/ 7/83	-0.2 0.7 3/ 7/83	-0.1 0.2 3/ 7/83	NA	ND
OH:COLUMBUS	219.7	3.2 1.8 3/ 7/83	0.2 0.8 3/ 7/83	0.1 0.2 3/ 7/83	NA	ND
OH:EAST LIVERPOOL	189.5	1.9 1.1 3/ 7/83	0.5 0.8 3/ 7/83	0.3 0.2 3/ 7/83	NA	ND
OH:PAINESVILLE	185.4	2.9 1.1 3/ 7/83	0.4 0.7 3/ 7/83	0.6 0.2 3/ 7/83	NA	ND
OH:TOLEDO	114.4	2.0 1.0 3/ 7/83	0.2 0.5 3/ 7/83	0.1 0.1 3/ 7/83	NA	ND
OK:OKLAHOMA CITY	171.7	2.4 1.2 3/ 7/83	-0.3 0.6 3/ 7/83	0.8 0.3 3/ 7/83	NA	ND

TABLE 12 (CONTINUED)

DRINKING WATER
ALPHA, BETA AND GAMMA CONCENTRATION

1982

ANNUAL ANALYSES

LOCATION	TOTAL SOLIDS mg/1	GROSS BETA DATE CTD. pCi/1 ± 2s	GROSS ALPHA DATE CTD. pCi/1 ± 2s	^{90}Sr pCi/1 ± 2s	^{226}Ra pCi/1 ± 2s	SPECIFIC GAMMA ACTIVITY
OR:PORTLAND	22.2	0.5 0.8	0.0 0.2 3/ 7/83	-0.3 0.4 3/ 7/83	NA	ND
PA:COLUMBIA	183.4	2.0 1.1	-0.2 0.5 3/ 9/83	0.2 0.2 3/ 9/83	NA	ND
PA:HARRISBURG	39.6	0.5 0.8	0.1 0.2 3/ 9/83	0.2 0.0 3/ 9/83	NA	ND
PA:PITTSBURGH	197.5	1.7 1.2	-0.4 0.7 3/ 9/83	0.1 0.3 3/ 9/83	NA	ND
PC:ANCON	85.6	1.2 0.9	0.0 0.4 3/ 9/83	-0.2 0.1 3/ 9/83	NA	ND
RI:PROVIDENCE	60.8	0.9 0.8	0.3 0.3 3/ 9/83	0.0 0.1 3/ 9/83	NA	ND
SC:BARNWELL	23.6	0.3 0.6	0.2 0.2 3/ 9/83	-0.2 0.1 3/ 9/83	NA	ND
SC:COLUMBIA	71.4	1.1 0.7	0.6 0.4 3/ 9/83	0.0 0.1 3/ 9/83	NA	ND
SC:HARTSVILLE	33.4	0.3 0.5	0.3 0.3 3/18/83	-0.7 0.9 3/18/83	NA	ND
SC:JENKINSVILLE	144.8	10.3 1.5	29.4 2.8 3/18/83	0.1 0.1 3/18/83	0.5 0.1	ND
SC:SENECA	36.4	0.9 0.9	0.1 0.2 3/18/83	0.0 0.1 3/18/83	NA	ND
TN:CHATTANOOGA	122.4	1.6 1.0	0.0 0.0 3/18/83	0.3 0.1 3/18/83	NA	ND
TN:KNOXVILLE	153.6	1.1 0.9	-0.1 0.6 3/18/83	0.1 0.2 3/18/83	NA	ND
TX:AUSTIN	168.3	2.7 1.2	0.0 0.0 3/18/83	0.0 0.2 3/18/83	NA	ND

TABLE 12 (CONTINUED)

DRINKING WATER
ALPHA, BETA AND GAMMA CONCENTRATION

1982

ANNUAL ANALYSES

LOCATION	TOTAL SOLIDS mg/l	GROSS BETA DATE CTD. pCi/l ± 2s	GROSS ALPHA DATE CTD. pCi/l ± 2s	^{90}Sr pCi/l ± 2s	^{226}Ra pCi/l ± 2s	SPECIFIC GAMMA ACTIVITY
VA:DOSWELL	167.2	6.0 1.3	0.1 0.5 3/19/83	0.1 0.1 3/19/83	NA	ND
VA:LYNCHBURG	92.4	0.7 0.9	0.0 0.3 3/19/83	0.0 0.1 3/19/83	NA	ND
VA:VIRGINIA BEACH	147.8	4.9 1.4	0.2 0.5 3/19/83	0.3 0.2 3/19/83	NA	ND
VI:ST. THOMAS	67.0	3.8 1.1	0.0 0.3 3/19/83	0.0 0.1 3/19/83	NA	ND
WA:RICHLAND	83.0	0.6 0.7	0.5 0.5 3/19/83	-0.1 0.1 3/19/83	NA	ND
WA:SEATTLE	38.8	0.7 0.8	0.0 0.2 3/19/83	0.1 0.1 3/19/83	NA	ND
WI:GENOA CITY	180.5	0.6 0.8	1.1 0.7 3/19/83	0.0 0.1 3/19/83	NA	ND
WI:MADISON	114.7	0.4 1.0	0.3 0.5 3/19/83	-0.2 0.1 3/19/83	NA	ND

* MN:RED WING Radium-228 4.8 ± .96 pCi/l

ND NO ACTIVITY DETECTABLE
NA NO ANALYSIS
s SIGMA COUNTING ERROR

TABLE 13

PLUTONIUM AND URANIUM ANALYSES
OF
SELECTED DRINKING WATER COMPOSITE SAMPLES

1982

LOCATION	^{238}Pu pCi/l	± 2s	^{239}Pu pCi/l	± 2s	^{234}U pCi/l	± 2s	^{235}U pCi/l	± 2s	^{238}U pCi/l	± 2s
CO:DENVER	0.009	0.009	0.000	0.000	1.467	0.170	0.049	0.017	1.079	0.131
CO:PLATTEVILLE	0.000	0.009	-0.002	0.005	6.114	0.719	0.145	0.037	4.996	0.593
GA:BAXLEY	0.001	0.012	0.000	0.000	0.048	0.021	0.000	0.000	0.032	0.015
IL:CHICAGO	0.005	0.012	0.002	0.004	1.456	0.165	0.010	0.008	0.065	0.019
MN:RED WING	0.001	0.006	0.003	0.005	0.212	0.042	0.004	0.005	0.011	0.009
MO:JEFFERSON CITY	0.026	0.018	0.004	0.006	1.156	0.167	0.040	0.023	0.106	0.036
MS:PORT GIBSON	0.013	0.013	0.000	0.000	0.047	0.019	0.002	0.004	0.033	0.016
NE:LINCOLN	-.005	0.009	0.002	0.005	2.990	0.344	0.073	0.024	2.045	0.244
NM:SANTA FE	0.008	0.012	0.000	0.005	5.218	0.593	0.192	0.041	3.925	0.454
NV:LAS VEGAS	0.001	0.007	0.004	0.004	2.395	0.302	0.069	0.023	1.467	0.195
SC:JENKINSVILLE	0.002	0.009	0.002	0.004	29.550	3.618	0.315	0.064	6.610	0.835

THE MINIMUM DETECTABLE LEVEL IS .015 pCi/SAMPLE, FOR EACH INDIVIDUAL ISOTOPE.

s SIGMA COUNTING ERROR

Radon-222 in Drinking Water

Radon-222 in drinking water has previously been considered a source of radiation exposure primarily from an ingestion standpoint. The Office of Radiation Programs (ORP) of the U.S. Environmental Protection Agency (EPA) is investigating radon in water supplies to evaluate the possibility that a major pathway from inhalation exposure may exist in addition to the ingestion pathway. As an inert gas, radon is not chemically bound to the water and consequently can be released during any operation that aerates or agitates water. Depending upon the initial concentration of radon in water, significant quantities of radon could be released in a home or to the general environment.

To determine the scope of this potential problem, a national ground water sampling program has been initiated by the Eastern Environmental Radiation Facility (EERF) to obtain data on radon concentrations in water supplies throughout the country. Sampling kits have been assembled by EERF and distributed to various state health departments. The kit is designed so that state personnel can collect samples from potable water supplies and ship them, without loss of radon other than radioactive decay, to EERF for analysis.

The selection of water supplies to be sampled is handled by two separate methods. Method 1 in which each state collects samples from all groundwater supplies serving at least 1000 people and Method 2 in which the choice of sampling locations and the number of supplies to be sampled is left to the discretion of the state programs. Each state is asked to obtain a representative sampling of ground water supplies within its boundaries. The extent of the sampling efforts and how representative the data are for a given state is determined primarily by the amount of time each state devotes to the program.

The concentrations of radon in water are determined at the EERF by liquid scintillation counting. The limit of detection for this technique using a 50-minute count and a 10-ml sample is 0.16 pCi or 16 pci/l.

The sampling kits are being provided to the various states on a rotating schedule. This schedule is designed to cover the U.S. within approximately two years.

Data will be published as it becomes available.

SECTION III. External Gamma Ambient Monitoring Program

The external gamma monitoring program, which began in October 1978, provides a continuous measurement of ambient gamma exposure rates, including cosmic, at selected sites throughout the continental United States. Data from this program will be used to evaluate fluctuations in natural background due to variations in environmental conditions and to provide a means of monitoring any significant increases in ambient gamma levels due to weapons fallout, reactor operations, etc. Initially, the program will consist of approximately 22 sites representing a wide geographic coverage throughout the country. Hopefully, at some later date additional sites will be added to the program. Although exposure measurements at these few sites are not totally representative of nationwide exposures, they will be indicative of national trends.

The monitoring program utilizes CaF_2:Mn thermoluminescent dosimeters (TLD's). These dosimeters are commercially available glass-bulb type dosimeters with energy compensating shields. A group of four TLD's is located at each station or site. Dosimeters are annealed by the station operator prior to positioning in the field. The dosimeters are returned to EERF for readout on an approximate one-month cycle. Several dosimeters are annealed by the station operator as controls and returned with the exposed field dosimeters to correct for any exposures accumulated during shipment.

Results from the period January - March 1983 are shown in Table 14.

TABLE 14

ENVIRONMENTAL GAMMA AMBIENT MONITORING PROGRAM

LOCATION	DATE RANGE	INTEGRATED EXPOSURE	EXPOSURE RATE	
		MR	MICRO R/HR ± 2 s *	
AL:MONTGOMERY	10383- 20283	5.1	7.2	4.0
AL:MONTGOMERY	20283- 30183	4.2	6.4	11.9
AL:MONTGOMERY	30183- 40183	4.9	6.6	11.7
CA:BERKELEY	123182- 20183	4.6	6.0	6.8
CA:BERKELEY	20183- 30183	3.9	5.7	8.7
CA:BERKELEY	30183- 40183	4.3	5.8	14.9
CO:DENVER	10583- 20283	9.5	14.1	3.3
CO:DENVER	20283- 30183	9.5	14.7	4.1
CO:DENVER	30183- 33183	10.5	14.6	7.1
FL:ORLANDO	10783- 13183	2.9	5.1	16.0
FL:ORLANDO	13183- 22883	3.8	5.6	5.7
FL:ORLANDO	22883- 40183	4.8	6.2	7.0
ID:BOISE	10683- 20183	7.1	11.3	11.7
ID:BOISE	20183- 30483	8.4	11.2	11.2
ID:BOISE	30483- 40583	8.5	11.1	3.9
IL:CHICAGO	10483- 20483	5.3	7.1	10.2
IL:CHICAGO	20483- 30483	4.5	6.6	7.2
IL:CHICAGO	30483- 40583	5.8	7.5	11.0
ND:BISMARCK	10483- 20383	6.1	8.6	7.2
ND:BISMARCK	20383- 30883	6.9	8.7	4.4
ND:BISMARCK	30883- 40483	5.4	8.3	5.8
NJ:TRENTON	10783- 20483	6.6	9.8	6.7
NJ:TRENTON	20483- 30783	7.1	9.6	5.9
NJ:TRENTON	30783- 40483	6.4	9.5	5.9
NM:SANTA FE	10783- 20483	9.3	13.8	5.4
NM:SANTA FE	20483- 30783	9.9	13.3	3.3
NM:SANTA FE	30783- 40583	9.3	13.4	5.7
NV:LAS VEGAS	10383- 20183	4.7	6.8	5.5
NV:LAS VEGAS	20183- 30283	4.6	6.6	9.1
NV:LAS VEGAS	30283- 33183	5.0	7.1	10.9
NY:NEW YORK	121482- 12083	6.4	7.2	6.4
NY:NEW YORK	12083- 20783	3.9	8.1	7.0
NY:NEW YORK	20983- 30983	4.8	7.2	12.1
NY:NEW YORK	30983- 41383	6.3	7.5	9.8
OH:COLUMBUS	10683- 20183	4.2	6.8	6.1
OH:COLUMBUS	20183- 30383	4.7	6.5	14.9
OH:COLUMBUS	30383- 40183	5.0	7.2	6.7
OK:OKLAHOMA CITY	10383- 20483	6.0	7.8	5.5
OK:OKLAHOMA CITY	20483- 30883	5.5	7.2	7.9
OK:OKLAHOMA CITY	30883- 41183	6.2	7.6	12.8
OR:PORTLAND	10483- 20183	5.0	7.4	5.7
OR:PORTLAND	20183- 30283	5.0	7.1	7.0
OR:PORTLAND	30283- 40883	6.9	7.8	5.5
PA:HARRISBURG	123082- 13183	4.8	6.2	6.7
PA:HARRISBURG	13183- 22883	4.2	6.3	4.2
PA:HARRISBURG	22883- 33083	4.4	6.1	16.5
PA:PITTSBURGH	10383- 20483	8.9	11.5	7.5

TABLE 14 (CONTINUED)

ENVIRONMENTAL GAMMA AMBIENT MONITORING PROGRAM

LOCATION	DATE RANGE	INTEGRATED EXPOSURE	EXPOSURE RATE	
		MR	MICRO R/HR ± 2 s *	
PA:PITTSBURGH	20483- 30183	7.4	12.3	5.3
PA:PITTSBURGH	30183- 40483	10.1	12.4	7.3
RI:PROVIDENCE	121382- 11383	7.5	10.1	6.9
RI:PROVIDENCE	11383- 20883	6.1	9.8	5.4
RI:PROVIDENCE	20883- 31083	7.0	9.8	5.0
RI:PROVIDENCE	31083- 41283	8.7	11.0	12.8
SC:BARNWELL	120782- 11383	8.3	9.3	6.0
SC:BARNWELL	11383- 22483	7.9	7.8	5.0
SC:BARNWELL	22483- 33183	6.5	7.8	10.6
SC:COLUMBIA	10483- 20183	5.8	8.7	5.5
SC:COLUMBIA	20183- 30183	5.5	8.1	9.7
SC:COLUMBIA	30183- 40183	6.8	9.2	8.8
TN:KNOXVILLE	123082- 20383	7.4	8.8	4.7
TN:KNOXVILLE	20383- 30183	5.7	9.2	3.5
TN:KNOXVILLE	30183- 33083	6.4	9.2	5.2
VA:RICHMOND	10383- 20283	5.6	7.8	7.5
VA:RICHMOND	20283- 30183	4.8	7.4	7.0
VA:RICHMOND	30183- 33183	7.4	10.2	10.3
VT:MONTPELIER	10483- 20983	5.4	6.2	6.8
VT:MONTPELIER	20983- 30483	4.0	7.2	8.3
VT:MONTPELIER	30483- 40183	4.8	7.1	11.2

* s = SIGMA ERROR (IN PERCENT)

SECTION IV. Milk Program

Pasteurized Milk

This is a cooperative program of the EPA, ORP and the Dairy and Lipid Products Branch, Milk Sanitation Section, Food and Drug Administration. Milk is a reliable indicator of the general populations intake of radionuclides since it is consumed by a large segment of the population and contains several of the biologically important contaminants resulting from environmental releases from nuclear activities. A primary function of this program is to obtain reliable monitoring data relative to current radionuclide concentrations and determine any long-term trends.

Monthly samples are collected at 65 sampling sites with one or more located in each state, Puerto Rico, and the Panama Canal. These are composite samples representing more than 80 percent of the milk consumed in a given population center.

These samples are analyzed for iodine-131, barium-140, cesium-137, and potassium. All 65 samples are analyzed annually in July for strontium-89, and strontium-90. Also, for the first month of the three quarters beginning January, April and October, 10 regional composite samples of milk made up from the states within each of EPA's 10 regions are analyzed for strontium-89 and strontium-90.

Iodine-131, barium-140, cesium-137 and potassium are determined by gamma spectral analysis. Strontium-89 and strontium-90 are determined by beta counting a total strontium precipitate which has been chemically separated by ion-exchange.

The values from the pasteurized milk samples for January - March 1983 are shown in Tables 15 - 17.

Strontium values from regional composite samples collected January - March 1983 are shown in Table 18.

Tritium in Milk

It was previously proposed to analyze all 65 milk samples for tritium in the aqueous and organic phases, on an annual basis (on the April sample). The EERF is currently evaluating alternative analytical techniques anticipating that these analyses will begin during the coming year.

TABLE 15

CONCENTRATIONS OF RADIONUCLIDES IN PASTEURIZED MILK

JANUARY 1983

LOCATION	DATE COLLECTED	K g/l±2s	^{137}Cs pCi/l±2s	^{140}Ba pCi/l±2s	^{131}I pCi/l±2s
AL:MONTGOMERY	1/ 6/83	1.74 0.25	-17 15	6 20	0 14
AR:LITTLE ROCK	1/ 4/83	1.68 0.17	2 11	11 15	-4 10
AZ:PHOENIX	1/ 6/83	1.48 0.24	-8 16	8 20	2 14
CA:LOS ANGELES	1/10/83	1.82 0.25	0 16	1 20	1 14
CA:SACRAMENTO	1/ 3/83	1.80 0.25	-2 16	8 21	-12 14
CA:SAN FRANCISCO	1/ 7/83	1.71 0.25	-7 16	9 20	-10 14
CO:DENVER	1/31/83	1.39 0.12	7 7	-6 9	0 7
CO:DENVER	1/ 3/83	1.82 0.18	-12 11	-5 14	1 10
CT:HARTFORD	1/ 3/83	1.79 0.17	0 11	-6 14	15 10
DC:WASHINGTON	1/ 7/83	1.70 0.24	7 16	1 20	-5 14
FL:TAMPA	1/11/83	1.74 0.25	10 16	3 20	-13 14
GA:ATLANTA	1/18/83	1.64 0.24	9 16	10 21	5 14
HI:HONOLULU	1/ 4/83	1.83 0.18	11 11	3 14	-6 10
IA:DES MOINES	1/ 3/83	1.70 0.17	-5 11	7 15	-2 10
ID:IDAHO FALLS	1/ 6/83	1.74 0.25	-8 16	12 21	-1 14
IL:CHICAGO	1/ 3/83	1.76 0.25	-12 16	-10 20	3 14
IN:INDIANAPOLIS	1/ 3/83	1.68 0.24	-3 16	8 20	1 14
KS:WICHITA	1/10/83	1.75 0.25	3 16	-1 20	0 14
KY:LOUISVILLE	1/ 2/83	1.78 0.17	-3 11	4 14	0 10
MA:BOSTON	1/ 4/83	1.93 0.25	16 16	-10 20	0 14
MD:BALTIMORE	1/ 7/83	1.74 0.25	2 16	6 20	-11 14
ME:PORTLAND	1/ 4/83	1.72 0.25	-1 16	11 21	5 14
MI:DETROIT	1/ 6/83	1.52 0.24	-8 16	-1 20	2 14
MI:GRAND RAPIDS	1/ 4/83	1.59 0.17	2 11	11 15	-2 10
MN:MINNEAPOLIS	1/10/83	1.83 0.25	-12 16	0 20	-6 14
MN:ST PAUL	1/ 5/83	1.57 0.24	-3 16	10 21	12 15
MO:KANSAS CITY	1/ 7/83	1.65 0.24	3 16	-13 20	2 14
MO:ST LOUIS	1/ 5/83	2.00 0.25	-7 16	-10 20	-3 14
MS:JACKSON	1/ 3/83	1.76 0.25	0 16	9 21	-1 14
MT:HELENA	1/ 3/83	1.60 0.24	2 16	-2 20	2 14
NC:CHARLOTTE	1/ 4/83	1.45 0.24	7 16	7 20	2 14
ND:MINOT	1/10/83	1.79 0.25	-5 16	3 20	9 14
NE:OMAHA	1/10/83	1.06 0.23	2 16	5 20	-5 14
NH:MANCHESTER	1/ 3/83	1.82 0.25	6 16	-9 20	-1 14
NJ:TRENTON	1/ 6/83	1.88 0.25	7 16	5 20	-8 14
NY:BUFFALO	1/ 3/83	1.63 0.17	4 11	0 14	1 10
NY:NEW YORK CITY	1/ 3/83	1.72 0.24	-2 16	-1 20	3 14
NY:SYRACUSE	1/ 3/83	1.94 0.25	-3 16	-5 20	-3 14
OH:CINCINNATI	1/ 3/83	1.54 0.24	12 16	4 20	4 14
OH:CLEVELAND	1/10/83	1.50 0.24	-7 16	3 20	6 14
OK:OKLAHOMA CITY	1/ 6/83	1.83 0.25	8 16	4 20	-9 14
OK:OKLAHOMA CITY	1/31/83	1.47 0.08	0 5	-2 6	0 5
OR:PORTLAND	1/ 4/83	1.65 0.24	7 16	6 20	4 14
PA:PHILADELPHIA	1/ 3/83	1.86 0.25	-5 16	-1 20	-2 14

TABLE 15 (CONTINUED)

CONCENTRATIONS OF RADIONUCLIDES IN PASTEURIZED MILK

JANUARY 1983

LOCATION	DATE COLLECTED	K g/l±2s	^{137}Cs pCi/l±2s	^{140}Ba pCi/l±2s	^{131}I pCi/l±2s
PA:PITTSBURGH	1/ 4/83	1.61 0.17	-5 11	0 14	-7 10
PC:CRISTOBAL	1/27/83	1.60 0.12	12 7	-3 9	-5 7
PR:SAN JUAN	1/21/83	1.68 0.24	-5 16	-3 20	6 14
SC:CHARLESTON	1/18/83	1.64 0.24	9 16	9 21	-10 14
TN:CHATTANOOGA	1/ 3/83	1.75 0.25	-2 16	-4 20	-3 14
TN:KNOXVILLE	1/ 3/83	1.68 0.24	3 16	-4 20	7 14
TN:MEMPHIS	1/27/83	1.90 0.25	-2 16	-1 20	9 14
TX:AUSTIN	1/13/83	1.64 0.24	-2 16	1 20	1 14
UT:SALT LAKE CITY	1/10/83	1.71 0.25	-5 16	7 20	-3 14
VA:NORFOLK	1/20/83	1.83 0.25	4 16	0 20	4 14
VT:BURLINGTON	1/ 3/83	1.86 0.25	5 16	2 20	2 14
WA:SEATTLE	1/ 3/83	1.63 0.17	-6 11	12 15	-3 10
WA:SPOKANE	1/ 3/83	1.79 0.25	-2 16	10 21	-1 14
WI:MILWAUKEE	1/ 3/83	1.65 0.24	4 16	-5 20	1 14
WV:CHARLESTON	1/10/83	1.69 0.24	2 16	0 20	-7 14
WY:LARAMIE	1/10/83	1.66 0.24	4 16	-19 20	7 14

s SIGMA COUNTING ERROR

TABLE 16

CONCENTRATIONS OF RADIONUCLIDES IN PASTEURIZED MILK

FEBRUARY 1983

LOCATION	DATE COLLECTED	K g/l±2s	^{137}Cs pCi/l±2s		^{140}Ba pCi/l±2s		^{131}I pCi/l±2s	
AL:MONTGOMERY	2/10/83	1.50 0.12	1	7	4	9	1	7
AR:LITTLE ROCK	2/ 7/83	1.55 0.12	5	7	1	9	0	7
AZ:PHOENIX	2/ 9/83	1.54 0.12	0	7	-10	8	4	7
CA:LOS ANGELES	2/14/83	1.48 0.12	5	7	2	9	-1	7
CA:SACRAMENTO	2/ 2/83	1.49 0.08	-1	5	0	6	0	5
CA:SAN FRANCISCO	2/11/83	1.56 0.12	3	7	-4	9	1	7
CO:DENVER	2/25/83	1.51 0.12	-5	7	-1	9	0	7
CT:HARTFORD	2/ 7/83	1.50 0.12	1	7	-1	9	-3	7
DC:WASHINGTON	2/ 4/83	1.52 0.08	4	5	0	6	-2	5
DE:WILMINGTON	2/ 9/83	1.52 0.12	4	7	1	9	-5	7
GA:ATLANTA	2/15/83	1.63 0.12	2	7	1	9	2	7
HI:HONOLULU	2/ 1/83	1.58 0.12	0	7	8	9	3	7
IA:DES MOINES	2/ 7/83	1.58 0.12	2	7	2	9	0	7
ID:IDAHO FALLS	2/ 1/83	1.76 0.17	-2	11	6	14	-1	10
IL:CHICAGO	2/ 7/83	1.77 0.25	-1	16	-2	20	-7	14
IN:INDIANAPOLIS	2/ 7/83	1.42 0.12	0	7	1	9	-2	7
KS:WICHITA	2/ 7/83	1.51 0.12	6	7	1	9	-2	7
KY:LOUISVILLE	2/ 7/83	1.62 0.12	4	7	-2	9	2	7
LA:NEW ORLEANS	2/10/83	1.50 0.12	6	7	2	9	-2	7
MA:BOSTON	2/ 8/83	1.48 0.12	3	7	-2	9	2	7
MD:BALTIMORE	2/ 4/83	1.55 0.12	0	7	-1	9	3	7
ME:PORTLAND	2/ 9/83	1.57 0.12	7	7	1	9	-3	7
MI:DETROIT	2/10/83	1.55 0.12	6	7	-2	9	0	7
MI:GRAND RAPIDS	2/ 8/83	1.55 0.12	3	7	-6	9	4	7
MN:MINNEAPOLIS	2/14/83	1.67 0.12	8	7	-5	9	1	7
MN:ST PAUL	2/ 8/83	1.56 0.12	3	7	7	9	5	7
MO:KANSAS CITY	2/11/83	1.57 0.12	2	7	-1	9	-4	7
MO:ST LOUIS	2/ 2/83	1.54 0.08	1	5	-4	6	-2	5
MS:JACKSON	2/ 8/83	1.53 0.12	10	7	-3	9	-1	7
MT:HELENA	2/ 8/83	1.52 0.12	3	7	1	9	1	7
NC:CHARLOTTE	2/ 7/83	1.66 0.17	2	11	5	15	-1	10
ND:MINOT	2/15/83	1.55 0.12	0	7	2	9	0	7
NE:OMAHA	2/11/83	0.60 0.10	0	7	2	8	1	7
NH:MANCHESTER	2/ 7/83	1.60 0.08	2	5	0	6	-1	5
NJ:TRENTON	2/ 3/83	1.52 0.12	0	7	3	9	5	7
NV:LAS VEGAS	2/ 7/83	1.48 0.12	5	7	-6	9	5	7
NY:BUFFALO	2/ 8/83	1.56 0.12	3	7	-5	9	5	7
NY:NEW YORK CITY	2/ 7/83	1.57 0.12	4	7	3	9	-2	7
NY:SYRACUSE	2/ 7/83	1.61 0.08	3	5	-2	6	1	5
OH:CINCINNATI	2/ 7/83	1.56 0.12	8	7	0	9	8	7
OH:CLEVELAND	2/ 7/83	1.47 0.12	11	7	5	9	-1	7
OR:PORTLAND	2/ 7/83	1.44 0.12	6	7	8	9	4	7
PA:PHILADELPHIA	2/ 7/83	1.53 0.12	4	7	-4	9	-4	7
PA:PITTSBURGH	2/ 8/83	1.53 0.12	4	7	5	9	-5	7

TABLE 16 (CONTINUED)

CONCENTRATIONS OF RADIONUCLIDES IN PASTEURIZED MILK

FEBRUARY 1983

LOCATION	DATE COLLECTED	K g/l±2s	^{137}Cs pCi/l±2s	^{140}Ba pCi/l±2s	^{131}I pCi/l±2s
PC:ANCON	2/24/83	1.43 0.12	15 7	-3 9	7 7
PR:SAN JUAN	2/18/83	1.58 0.12	3 7	4 9	1 7
SC:CHARLESTON	2/15/83	1.45 0.12	8 7	2 9	5 7
SD:RAPID CITY	2/14/83	1.50 0.12	5 7	0 9	-1 7
TN:CHATTANOOGA	2/ 7/83	1.63 0.12	0 7	-4 9	-3 7
TN:MEMPHIS	2/24/83	1.52 0.12	4 7	-1 9	1 7
TX:AUSTIN	2/17/83	1.62 0.12	-1 7	6 9	-1 7
UT:SALT LAKE CITY	2/ 7/83	1.50 0.12	3 7	3 9	-1 7
VA:NORFOLK	2/18/83	1.61 0.12	6 7	3 9	-1 7
VT:BURLINGTON	2/ 7/83	1.50 0.12	3 7	4 9	-1 7
WA:SEATTLE	2/ 1/83	1.47 0.12	6 7	8 9	-2 7
WA:SPOKANE	2/ 7/83	1.51 0.12	1 7	4 9	-1 7
WI:MILWAUKEE	2/ 1/83	1.53 0.08	1 5	0 6	-2 5
WV:CHARLESTON	2/15/83	1.57 0.12	1 7	-8 9	7 7
WY:LARAMIE	2/ 7/83	1.52 0.08	2 5	1 6	0 5

s SIGMA COUNTING ERROR

TABLE 17

CONCENTRATIONS OF RADIONUCLIDES IN PASTEURIZED MILK

MARCH 1983

LOCATION	DATE COLLECTED	K g/l±2s	^{137}Cs pCi/l±2s		^{140}Ba pCi/l±2s		^{131}I pCi/l±2s	
AL:MONTGOMERY	3/10/83	1.56 0.12	1	7	8	9	-2	7
AR:LITTLE ROCK	3/ 7/83	1.47 0.12	8	7	0	9	-2	7
AZ:PHOENIX	3/10/83	1.64 0.12	4	7	6	9	-2	7
CA:LOS ANGELES	3/14/83	1.62 0.12	6	7	4	9	2	7
CA:SACRAMENTO	3/ 2/83	1.48 0.12	-1	7	8	9	-1	7
CA:SAN FRANCISCO	3/ 3/83	1.59 0.08	2	5	3	6	0	5
CO:DENVER	3/30/83	1.59 0.13	-3	7	-2	9	-1	7
CT:HARTFORD	3/ 7/83	1.56 0.12	2	7	1	9	2	7
DC:WASHINGTON	3/ 4/83	1.66 0.12	3	7	-5	9	2	7
DE:WILMINGTON	3/ 2/83	1.54 0.24	11	16	6	20	0	14
GA:ATLANTA	3/ 1/83	1.46 0.12	6	7	-2	9	-3	7
HI:HONOLULU	3/ 1/83	1.52 0.12	5	7	0	9	0	7
IA:DES MOINES	3/ 7/83	1.56 0.12	4	7	4	9	-1	7
ID:IDAHO FALLS	3/ 2/83	2.01 0.25	-3	16	14	21	-4	14
IL:CHICAGO	3/ 7/83	1.87 0.25	3	16	-8	20	-7	14
IN:INDIANAPOLIS	3/ 7/83	1.50 0.08	5	5	2	6	4	5
KS:WICHITA	3/21/83	1.42 0.12	-1	7	2	9	-1	7
KY:LOUISVILLE	3/ 7/83	1.47 0.12	-3	7	3	9	2	7
LA:NEW ORLEANS	3/24/83	1.52 0.24	1	16	5	20	-7	14
MA:BOSTON	3/ 8/83	1.60 0.09	4	5	2	6	-2	5
MD:BALTIMORE	3/ 4/83	1.55 0.08	4	5	2	6	4	5
ME:PORTLAND	3/ 8/83	1.71 0.25	10	16	16	21	-13	14
MI:DETROIT	3/ 9/83	1.52 0.12	1	7	5	9	0	7
MI:GRAND RAPIDS	3/ 7/83	1.66 0.11	0	6	1	8	1	6
MN:MINNEAPOLIS	3/ 7/83	1.65 0.12	2	7	3	9	4	7
MN:ST PAUL	3/ 1/83	1.60 0.12	0	7	8	9	-2	7
MO:KANSAS CITY	3/10/83	1.56 0.08	3	5	7	6	0	5
MO:ST LOUIS	3/ 2/83	1.59 0.12	2	7	0	9	1	7
MS:JACKSON	3/17/83	1.56 0.12	7	7	6	9	0	7
MT:HELENA	3/ 8/83	1.62 0.12	1	7	2	9	1	7
NC:CHARLOTTE	3/ 7/83	1.50 0.24	8	16	11	21	-6	14
ND:MINOT	3/ 7/83	1.58 0.08	-4	5	2	6	2	5
NE:OMAHA	3/10/83	1.37 0.12	-2	7	-3	9	3	7
NH:MANCHESTER	3/ 7/83	1.72 0.25	8	16	8	21	-4	14
NJ:TRENTON	3/ 4/83	1.54 0.12	-2	7	9	9	0	7
NM:ALBUQUERQUE	3/ 7/83	1.49 0.08	0	5	0	6	-1	5
NV:LAS VEGAS	3/ 8/83	1.57 0.12	8	7	6	9	4	7
NY:BUFFALO	3/ 7/83	1.60 0.12	1	7	3	9	1	7
NY:NEW YORK CITY	3/ 7/83	1.59 0.08	6	5	-5	6	-2	5
NY:SYRACUSE	3/ 7/83	1.49 0.12	4	7	4	9	-3	7
OH:CINCINNATI	3/ 8/83	1.52 0.12	1	7	-1	9	5	7
OH:CLEVELAND	3/ 8/83	1.47 0.12	5	7	7	9	2	7
OK:OKLAHOMA CITY	3/ 1/83	1.49 0.12	2	7	0	9	1	7
OR:PORTLAND	3/ 8/83	1.58 0.08	1	5	7	6	2	5

TABLE 17 (CONTINUED)

CONCENTRATIONS OF RADIONUCLIDES IN PASTEURIZED MILK

MARCH 1983

LOCATION	DATE COLLECTED	K g/l±2s	^{137}Cs pCi/l±2s	^{140}Ba pCi/l±2s	^{131}I pCi/l±2s
PA:PHILADELPHIA	3/ 7/83	1.74 0.25	-5 16	15 21	0 14
PA:PITTSBURGH	3/ 8/83	1.58 0.12	7 7	7 9	3 7
PC:CRISTOBAL	3/24/83	1.52 0.12	8 7	4 9	0 7
PR:SAN JUAN	3/18/83	1.44 0.12	13 7	6 9	-2 7
SC:CHARLESTON	3/22/83	1.42 0.12	9 7	-3 9	0 7
TN:CHATTANOOGA	3/ 7/83	1.58 0.08	3 5	0 6	-1 5
TN:MEMPHIS	3/29/83	1.52 0.12	1 7	-1 9	4 7
TX:AUSTIN	3/ 8/83	1.42 0.12	4 7	4 9	0 7
UT:SALT LAKE CITY	3/ 7/83	1.53 0.12	3 7	-5 9	2 7
VA:NORFOLK	3/21/83	1.54 0.12	4 7	-1 9	-2 7
VT:BURLINGTON	3/ 4/83	0.74 0.11	2 7	0 8	-1 7
WA:SEATTLE	3/ 7/83	1.56 0.12	-2 7	5 9	6 7
WI:MILWAUKEE	3/31/83	1.59 0.13	4 7	-3 9	3 7
WI:MILWAUKEE	3/ 1/83	1.53 0.12	-1 7	4 9	1 7
WV:CHARLESTON	3/21/83	1.89 0.25	-3 16	1 20	7 14
WY:LARAMIE	3/ 7/83	1.55 0.12	1 7	5 9	1 7

s SIGMA COUNTING ERROR

TABLE 18

STRONTIUM-90 AND STRONTIUM-89 IN PASTEURIZED MILK

EPA REGIONAL COMPOSITES

JANUARY - MARCH 1983

EPA REGION	^{90}Sr pCi/l ± 2s	^{89}Sr pCi/l ± 2s*
I	2.8 0.4	-1 0
II	2.0 0.4	1 1
III	2.5 0.9	1 1
IV	2.0 0.9	1 2
V	3.5 0.7	-1 1
VI	3.2 0.8	0 1
VII	2.8 0.6	0 1
VIII	2.4 0.8	0 1
IX	0.8 0.5	0 1
X	1.7 0.4	0 1

s SIGMA COUNTING ERROR
s* ANALYTICAL ERROR TERM WHICH CLOSELY APPROXIMATES THE COUNTING ERROR

Carbon-14 in Milk

Nine stations, chosen for wide geographical distribution, contribute milk samples for annual analysis for carbon-14. These samples have monitored the carbon-14 levels in the food chain resulting from nuclear testing.

Analysis consists of combusting the samples and measuring released carbon dioxide through liquid scintillation.

Data will be published as it becomes available.

Radiological Health Laboratory
Indiana State Board of Health

Indiana Milk Analysis Program

In order to evaluate the fallout on Indiana pasturelands, the State has implemented a program whereby monthly milk samples from five geographical areas are sent to the Radiological Health Laboratory of the State Board of Health. The milk in these samples is bottled on the same date in all five areas to provide uniform time from pasture to the lab.

Once in the laboratory, the milk is first analyzed by gamma spectroscopy for iodine-131, barium-140, cesium-137, and potassium-40. A one gallon sample is analyzed on a 3" x 3" NaI(Tl) scintillation crystal for 4800 seconds. A background sample of 48,000 seconds is also run. The data are analyzed to give pCi/l for each radionuclide.

A quarterly composite sample is saved and run for strontium-89 and -90 by ion exchange method.

Data will be published as it is received.

Radiological Health Division
State Hygienic Laboratory of Iowa

Iowa Water Sampling Program

The radiological Health Division of the State Hygienic Laboratory of Iowa with the assistance of the State Department of Environmental Quality (DEQ) maintains a state-wide water sampling program of community drinking waters, surface waters and precipitation. All analyses with the exception of the sequential Ra-226, -228 analyses are performed according to "Standard Methods for the Examination of Water and Wastewater", 14th edition. The sequential analyses for radiums are performed according to the EPA publication, EPA-600/4-75-008, "Interim Radiochemical Methodology for Drinking Water."

The drinking water samples are collected by DEQ regional personnel and sent to the State Hygienic Laboratory where they are preserved with HCl. These waters are analyzed for gross alpha and gross beta radioactivity as a screening process. Subsequent analyses for Ra-226, Ra-228, Sr-90 are performed if screening levels are exceeded. Radium levels are of primary concern in Iowa drinking waters as those levels are elevated in deep geologic aquifers within the state.

Surface waters are collected at eleven sites throughout the state with site selection being determined by proximity upstream and downstream to nuclear power plants in Iowa or those plants discharging into rivers which are natural borders with adjoining states. Gross alpha, gross beta, and tritium are the routine radionuclide analyses for these samples. Strontium is of interest when gross beta screening levels are exceeded or if nuclear weapons testing necessitates monitoring to determine its impact on the environment.

Data will be published as it is received.

ENVIRONMENTAL RADIATION DATA (ERD) is published quarterly (January, April, July, October) by the U. S. Environmental Protection Agency's office of Radiation Programs.

Requests for information concerning publication and distribution of ERD should be directed to:

Charles M. Petko
Technical Support Branch
Eastern Environmental Radiation Facility
P. O. Box 3009
Montgomery, Alabama 36193

Requests for information concerning the operation of ERAMS should be directed to:

H. Michael Mardis, Chief
Monitoring and Analytical Services Branch
Eastern Environmental Radiation Facility
P. O. Box 3009
Montgomery, Alabama 36193

or to:

Lewis Battist, Chief
Environmental Studies and Statistics
Analysis and Support Division (ANR-461)
U. S. Environmental Protection Agency
Waterside Mall East
401 M Street, SW
Washington, DC 20460

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